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Construction Methods and Equipment

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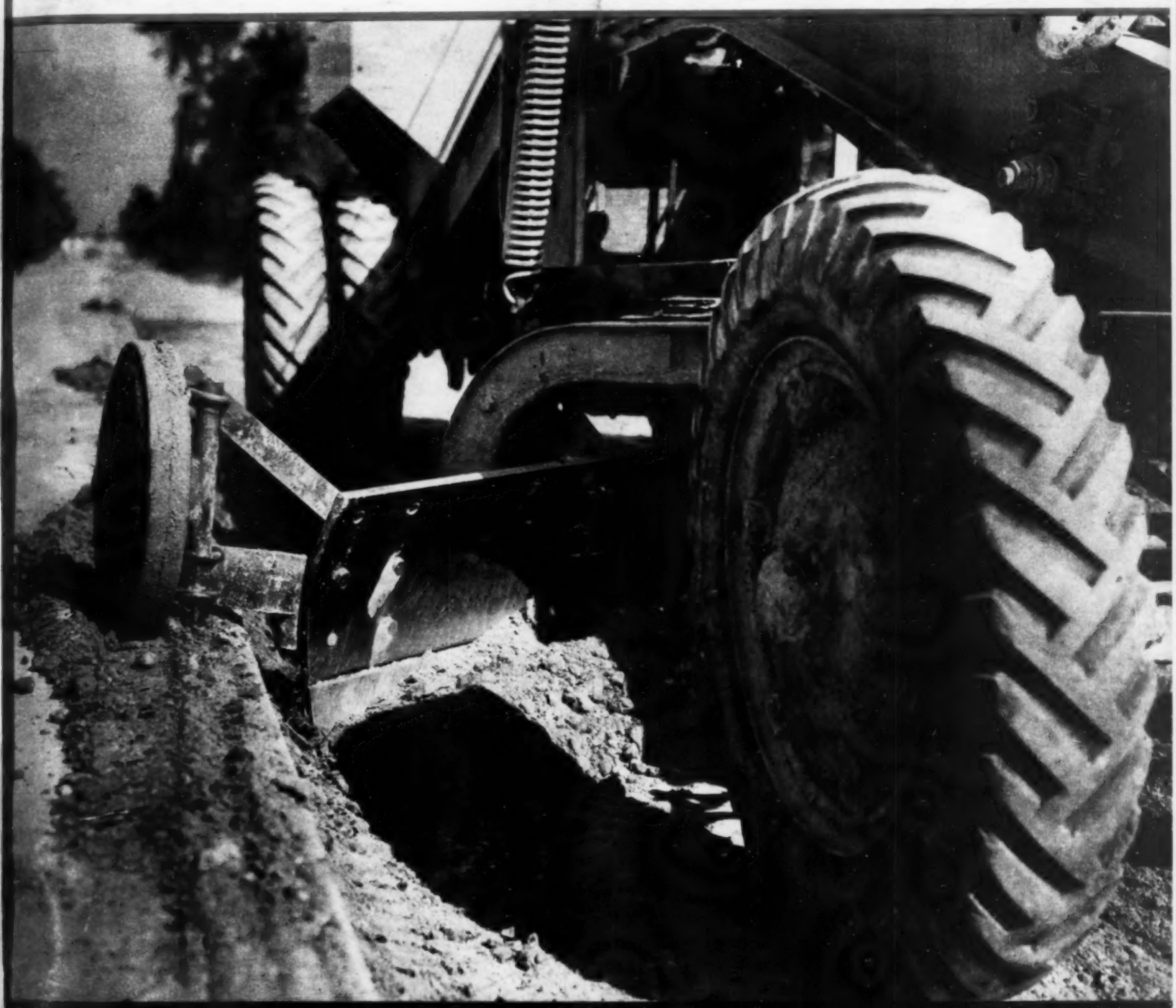


IN THIS ISSUE:

ROAD SOIL STABILIZATION with diverse local materials in Pennsylvania

PLYWOOD PANELS used to build warehouse

SERVICING EQUIPMENT on road and bridge jobs

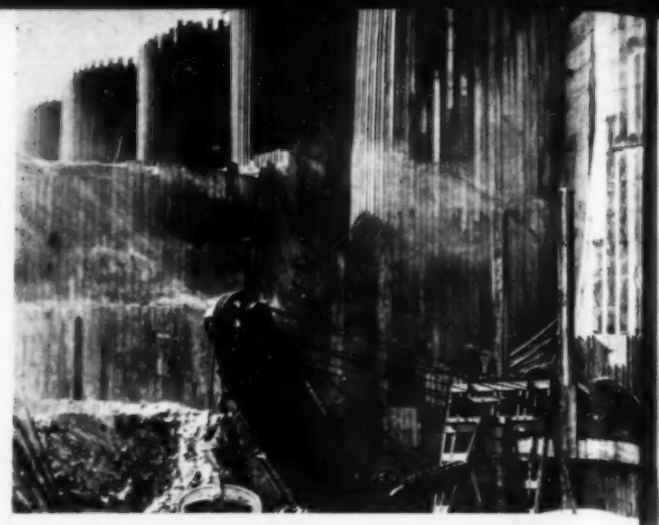
PRE-PLANNED HOUSES, with details of good and bad building practice

ROOF JACKED UP to add story to post office

HUMAN RELATIONS on heavy construction

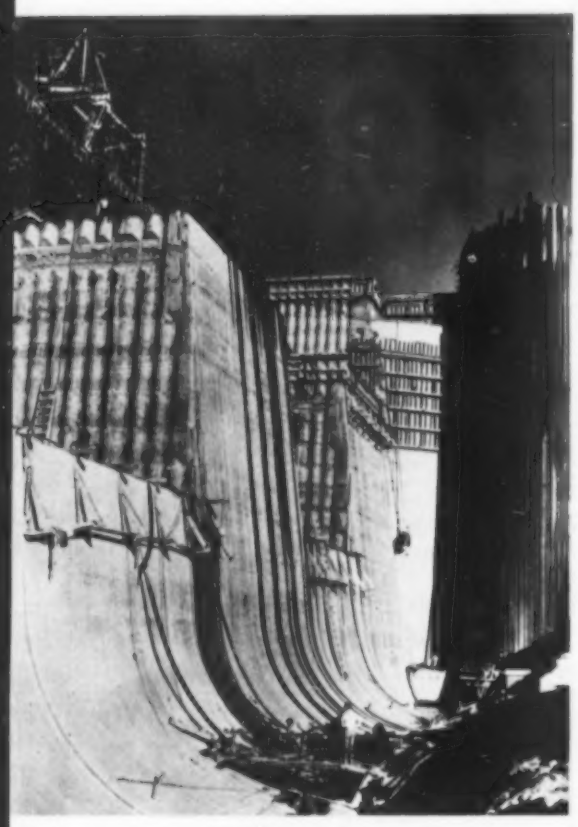
MORE ABOUT INLAND PILING AT GRAND COULEE

1 Here are the foundations of the Grand Coulee Dam. They were built inside watertight walls of Inland Sheet Piling. The high water mark of the river is shown on the piling wall in the background.



2 Safety Behind Steel Walls. Working on the dry side while the powerful river current swirled against the other side of the piling cells. At the right is seen a portion of block 40 of the partly completed dam.

3 The Grand Coulee Job in Progress. It's the biggest construction job in the world's history, and will cost some $260,000,000. Eventually it is to rise as high as a 55-story skyscraper with a wall three times as wide as the *Queen Mary*. You can see the use of Inland Piling at the vital point, east cofferdam (middle right), in turning the river.



4 Assembling and driving the Inland Piling a second time. Imagine the punishment these Inland sections withstood in being driven and pulled from their first location. Yet the interlocks are undamaged, capable of repeated service.

5 Massive Towers of Strength. The Inland Piling cell at the right was part of the original west-side cofferdam within which the concrete foundations at the left were built. Later it became part of the original system of cofferdams which turned the river out of its original bed for final excavations.

TECHNOLOGY DEPT.

These pictures effectively illustrate Inland's ability to take care of one of the largest and most difficult piling jobs. Inland Piling is tough, strong and tight. The accurate interlocks assure free driving. Experienced Inland engineers are particularly helpful in co-operating from the plans to the completed job. The next time you need piling, it will pay

INLAND STEEL CO.

38 SOUTH DEARBORN STREET, CHICAGO
DETROIT • KANSAS CITY • MILWAUKEE • ST. LOUIS • ST. PAUL

SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES

Construction Methods and Equipment

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WILLARD CHEVALIER, Vice-President

MARCH, 1938

CURRENT JOBS

. . . . and Who's Doing Them

SEWERS

In Detroit, Mich., **Penker Construction Co.**, of Cincinnati, Ohio, was awarded $1,099,500 contract for sludge filter and incinerator building. **L. H. Prentice Co.**, of Chicago, is building in that city $460,485 pump and blower house for sewage treatment works. In Pueblo, Colo., a $395,298 sewage works contract went to **Thomas Bates and Son**, of Denver. An intercepting sewer in Chicago, to cost $207,581, is being built by **Santucci Construction Co.**, of Niles Center, Ill. **E. M. Roche**, of Freeport, Ill., is building a $298,213 sewage system in Waterloo, Ia.

BRIDGES

Dufresne Construction Co., Ltd., of Montreal, Canada, is building a $2,500,000 bridge in Quebec. At Lynbrook, N. Y., **Poirier & McLane Corp.**, of New York City, received award of $1,600,000 for grade-crossing elimination structures. Contract for railway facilities in connection with San Francisco-Oakland Bay bridge was awarded to **Barrett & Hilp**, of San Francisco, for $370,285. Near Buffalo, N. Y., **Metzger Construction Co.**, of Buffalo, has a $320,784 grade elimination project.

DAMS

Contract for topping out Grand Coulee dam, on Columbia River in state of Washington, was awarded to **Consolidated Builders Inc.**, (formerly called Interior Construction Co.) of San Francisco, at estimated cost of $34,442,240. Contract for constructing Crooked Creek dam at Ford City, Pa., was awarded to **G. M. Brewster & Sons**, Bogota, N. J., for $2,367,511. At Tionesta, Pa., a $2,624,610 Allegheny River dam contract was bid in by **S. J. Groves & Son Co.**, of Minneapolis. In Utah, **Rohl-Connolly Co.**, of Los Angeles, were successful bidders for Deer Creek dam to cost $2,189,097. Mississippi River dam No. 24 at Clarksville, Mo., brought low bid of $2,699,142 from **Central Engineering Co.**, of Davenport, Ia. A $1,456,624 contract for penstock pipes at Grand Coulee dam in Washington, went to **Western Pipe & Steel Co.**, of San Francisco.

HIGHWAYS

Recent highway contract awards included the following: Ohio: In Hamilton County, $478,832, to **Penker Construction Co.**, of Cincinnati. New York: In Borough of Bronx, $432,335, to **Garafano Construction Co.**, of Mt. Vernon, N. Y. Near West Plattsburg, $277,272, to **W. F. Yakey**, of Rochester. Illinois: In Washington County, $280,058, to **J. Mackler & Co.**, of Chicago Heights. Near Sparta, $190,652 to **Central West Construction Co.**, Chicago. Virginia: In Nansemond County, $287,068, to **W. H. Scott**, of Franklin. California: At Yerba Buena Island, San Francisco, $228,369, to **Healey-Moore Co.** and **Frederickson & Watson Construction Co.**, of Oakland. Alabama: Near Florence, $211,450, to Clark, **Kearney & Stark**, of St. Louis, Mo. In Coosa County, $204,123, to **Hardaway Contracting Co.**, of Columbus, Ga. North Dakota: In Pembina County, $202,713, to **Megarry Bros.**, of Bismark.

Kentucky: Near Versailles, $239,548, to **Codell Construction Co.**, of Winchester, Mississippi: In La Flore County $282,814, to **Service Construction Co.**, of Poplar Bluff, Mo. Texas: In Coryell County, $220,702, to **Thomas & Ratliff**, of Rogers, Tex.

BUILDINGS

Public — Power house and administration building for Department of Public Works, St. Thomas, Ontario, Canada, is being built by **Pigott Construction Co., Ltd.**, of Hamilton, for $1,300,000. Hospital buildings at Norristown, Pa., went to **McCloskey & Co.**, of Philadelphia, for $632,200. Another hospital job at Pennhurst, Pa., was awarded to **Irwin & Leighton**, of Philadelphia, for $636,000. Low bidder for a hospital addition in White Plains, N. Y., was **C. R. Place**, of New York City, with a price of $1,200,000. Prison buildings at Auburn, N. Y., were bid in for $638,300 by **C. F. Haglin & Sons Co.**, of Buffalo, N. Y. In Jefferson City, Mo., **Lehr Construction Co.**, of St. Joseph, Mo., received a $753,026 contract for a 7-story state office building.

A marble library building at Salem, Ore., is being constructed by **L. H. Hoffman**, of Portland, Ore., for $712,941. High school construction by **Rugo Construction Co.**, of Boston, Mass., is under way at cost of $681,186, in Rochester, N. H. In Ottawa, Canada, **Collet Bros., Ltd.**, of Montreal, are building a $600,000 French Legation building. A high school in Bayshore, N. Y., to cost $679,000 is under construction by **Bowe Construction Co.**, of Long Island City, N. Y. **A. Smith & Co.**, of Chicago, are building a $489,900 high school in Niles Center, Ill. Another high school at Kansas City, Mo., is being built for $431,842 by **J. E. Dunn Construction Co.**, of Kansas City. For remodeling U. S. Post Office building in New York City, **Delmar Construction Co.**, of Philadelphia, submitted low bid of $585,000. Another New York City post office building to cost $574,585 is under construction by **George F. Driscoll Co.**, of Brooklyn. For a state armory at Manchester, N. H., low bid of $605,601 was submitted by **Davison Construction Co.**, of Manchester.

Commercial — Under separate contracts **M. K. Stevens**, Franklin Trust Building, Philadelphia, Pa., is starting a $6,000,000 housing development of 2- and 3-story duplex apartment buildings in Philadelphia, Pa. A $4,000,000 housing project to include 400 2-story brick residences has been started in Springfield, Pa., by **Dura-Bilt Homes Corp.**, of Philadelphia. In Rockefeller Center, New York City, **Hegeman-Harris Co., Inc.**, of New York City, is erecting a 15-story building to cost $2,500,000. **Whitman Construction Co.**, of West Caldwell, N. J., is engaged on a 150-unit housing project to cost $1,650,000. Another New Jersey housing project at Cedar Grove, involving 200 homes to cost $1,300,000, is under way by **Hughes Homes, Inc.**, of Verona, N. J. **Schneider Wagner Corp.**, of Union, N. J., are engaged on a $1,400,000 housing project in that community. In Baltimore, the **Ring Construction Co.**, of Alexandria, Va., was awarded contract for group of 57 apartment buildings to cost $1,000,000. A $1,000,000 housing project in Flushing, N. Y., is being started by **Forest Park Homes, Inc.**, of Glendale, N. Y. Another $1,000,000 apartment building project is under way in Houston, Tex., by **River Oaks Corp.**, of Houston. In Atlanta, Ga., **Jones Construction Co.**, of Charlotte, N. C., was awarded $800,000 contract for 11 buildings in Atlanta. **Gordon Construction Co.**, of Tulsa, Okla., is engaged on a $750,000 10-story apartment building in that city.

Industrial — A refinery for the Pure Oil Co., at Nederland, Tex., to cost $2,500,000 is being built by **Lummus Co.**, of New York City; the **Lummus Co.** is also building a $1,300,000 refinery unit for the General Petroleum Co., at Torrance, Calif.

The "How" of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How SPECIAL DERRICK hoisted gate operating machinery for Fort Peck dam. — p. 33

How PRE-PLANNING puts more value into houses. — p. 36

How HOUSE PLUMBING and wood framing can be coordinated. — p. 36

How DIAGONAL SHEATHING stiffens house structure. — p. 37

How ACCURATE FRAMING of house rafters provides solid bearing. — p. 38

How BETTER TOOLS enable carpenters to improve building quality. — p. 40

How JACKING raised roof to add story to post office. — p. 41

How ROAD SOIL STABILIZATION utilized diverse local materials. — p. 42

How TAIL-GATE DUMPING, controlled by hand lever, distributed accurate volume of binder soil. — p. 43

How DISK HARROW mixed gravel and clay. — p. 44

How GUIDE WHEEL ATTACHMENT aided operator of blade grader. — p. 44

How GRADATION of soil mortar for stabilized roads was determined by hydrometer test. — p. 46

How SERVICING of construction equipment on job cut costs and speeded work. — p. 48

How LUBRICATION of construction equipment was standardized. — p. 49

How PLYWOOD PANELS formed insulated walls for cold-storage warehouse. — p. 52

How PAINT improved appearance of store building. — p. 53

How THICKNESS of concrete for pavement was tested by needle and disk. — p. 56

How BENT PIPE was straightened. — p. 56

How SHORTENED BOOM enabled power shovel to work in cramped quarters. — p. 56

How ELECTRIC BRUSH tested thickness of pipe coating. — p. 56

How PAVEMENT CORRUGATIONS were removed by heater-planer. — p. 57

How PILE-DRIVING MAST handled 70-ft. piles on bridge widening job. — p. 57

How CANTILEVER METHOD was applied to erection of 600-ft. steel arch spans for bridge. — p. 57

How EMPLOYEE WELFARE helps maintain construction organizations. — p. 58

ROBERT K. TOMLIN, Editor — A. E. PAXTON, Manager

Editorial Staff: Vincent B. Smith, Paul Wooton (Washington), Nelle Fitzgerald

Planning and Plant — the Basis of Profit

IN this issue Messrs. Ackerman and Locher bring to a close their notable series of articles on "Planning and Plant for Heavy Construction." For more than two years this journal has carried in each issue an installment of that series dealing with some aspect of construction plant or planning. The interest in these articles, as expressed by many readers to both the author and the editor, has been ample evidence that construction men in many capacities are fully aware that a job well planted is a profit half earned.

Recently this writer enjoyed an extended motor trip as guest of a well-known and successful contractor. We were fanning away about the topics that always interest construction men and we got off on this subject of plant.

"I have lost a lot of money," he said, "trying to do jobs with equipment I happened to have on hand. I came into construction from a manufacturing industry where I used to hesitate about buying a new piece of machinery; and it took me a long time and some costly experience before I learned that, in construction, new plant for each job frequently is the truest economy.

"I do not, of course, offer that as a fixed rule," he explained, "but I do say that no contractor can afford to commit himself to his old equipment, either in figuring a job or in planning it, until he has looked over the advertisements and other information offered by the equipment manufacturers. He can be pretty sure that some competitor is going to tackle that job with the very latest and most efficient plant that is available, so it pays to check up pretty carefully on comparative costs before deciding to 'play these.' And when he does check up, it is remarkable how often he'll decide that he'd better draw a couple instead of standing pat."

Surely what Messrs. Ackerman and Locher have developed in their articles will confirm the lessons of this man's experience.

It is noteworthy and altogether fitting that the authors should conclude their series by an article on "Human Relations." For, after all, however men may contrive methods and machinery to lighten their burdens, they cannot get the full benefit of their ingenuity unless human intelligence, skill and good-will is put into getting the most out of their machines.

TODAY industry in every field is alive to the increasing importance of this phase of management. Construction cannot afford to lag behind that progress. Once construction was largely a matter of "strong backs and weak minds." It bred a certain type of management, highly effective and efficient for its time and setting. Then power and the machine came into construction and, of necessity, a new school of management came along with them. Some of its tenets are set forth by the authors in this closing installment, in full recognition of the trend of the times. And throughout the industry thoughtful constructors are giving in their own practice equal recognition to that trend.

In congratulating Messrs. Ackerman and Locher on the completion of their two-year labors in behalf of better construction practice, this writer can do no better than repeat the hope that he expressed when he introduced the series; viz., that the authors "would stimulate a keen interest in planning and plant for more efficient construction. For that is the foundation on which we must rebuild the prosperity of the industry and of everyone dependent on it for his wages, salary, commissions, profits or dividends."

Willard Chevalier

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IT DIDN'T GET COLD

BUT THIS CONTRACTOR WASN'T TAKING CHANCES

MID-WINTER weather in Mississippi is something like early Spring up North: the thermometer plays some funny tricks — a few mild days, and down goes the temperature, just like that! No time to be taking chances with frozen concrete.

So, when Leake & Goodlett, Inc., built New Albany, Miss., City Hall last winter, they used 'Incor' 24-Hour Cement exclusively, on advice of E. L. Malvaney, architect, and R. M. Striger, engineer. Result:

(1) 24-hour service strength avoided danger of sudden freeze — it didn't get cold, but they weren't taking chances; (2) damp-proof concrete, which, said Mr. Striger, could be obtained with 'Incor' cheaper than any other way he knew; and (3) beautiful natural concrete surfaces that didn't have to be touched after stripping, except for a little patching here and there. Quality concrete at minimum cost.

Sound reasons, all, for figuring 'Incor'* on work now in progress. Use 'Incor' if reduced time, form and heat-protection costs show a net saving; if not, use Lone Star Cement — quality standard for over a quarter century. Write for copy of "Cold-Weather Concreting." Lone Star Cement Corporation, Room 2263, 342 Madison Ave., New York. * Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

MAKERS OF LONE STAR CEMENT...'INCOR' 24-HOUR CEMENT

GULF LUBCOTE HAS REMARKABLE ADHESIVE PROPERTIES

This tough, tenacious lubricant clings to metal surfaces... saves gear wear

GULF Lubcote has given a new meaning to the words "gear lubrication" to hundreds of contractors from Maine to Texas.

Here is a *modern* gear lubricant — a special petroleum product which combines exceptionally high adhesiveness for metal surfaces with natural high viscosity and efficient lubricating qualities.

This heavy-bodied lubricant resists the wiping action of gears in motion, resists heat and decomposition and retains its original fluidity and high lubricating qualities for longer periods of time.

Gulf Lubcote is made in seven grades to fit various gear types, open or enclosed, and to provide for a wide range of operating conditions. Use it to lengthen the life of your gear trains and keep them operating without noise.

Four Reasons.. WHY GULF LUBCOTE IS THE LUBRICANT OF UNPARALLELED QUALITY FOR OPEN GEARS

1 GULF LUBCOTES are heavy-bodied products especially manufactured to have the requisite property of high adhesiveness for metal surfaces necessary in lubricants for open gears.

2 Due to selected crudes used and to the process of refinement employed, GULF LUBCOTES possess unusual lubricating qualities together with the essential property of flowing with the movement of the gear and pinion teeth.

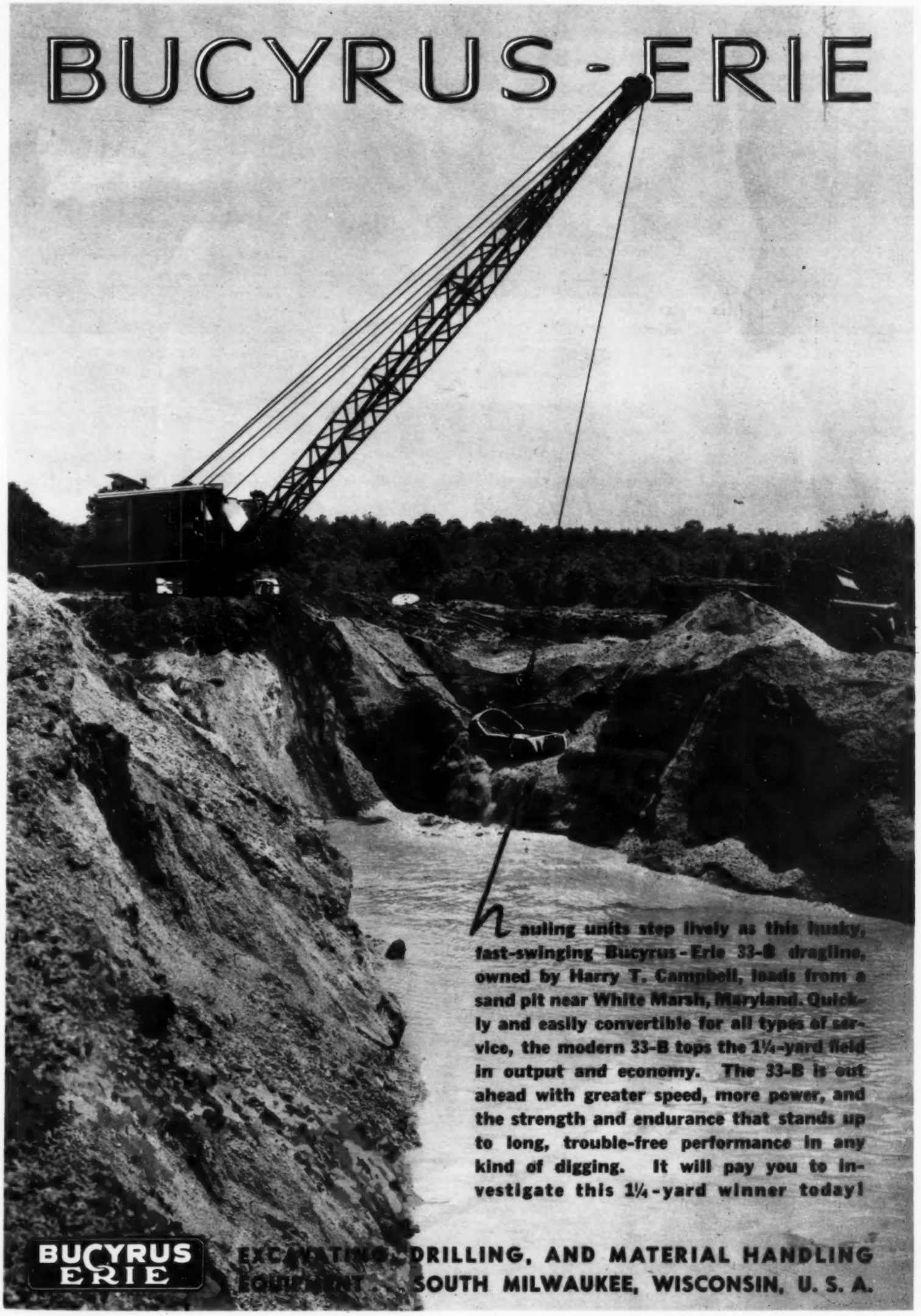
3 The lubricating film provided by GULF LUBCOTES, in addition to being impervious to moisture, acid fumes and gases, will withstand extreme temperature changes without deterioration.

4 Due to the tough and tenacious nature of GULF LUBCOTES they will effectively reduce objectionable gear noise and at the same time will provide maximum protection against corrosion, pitting or excessive wear of the gear teeth.

GULF OIL CORPORATION
GULF REFINING COMPANY
GENERAL OFFICES: GULF BUILDING, PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

BUCYRUS-ERIE

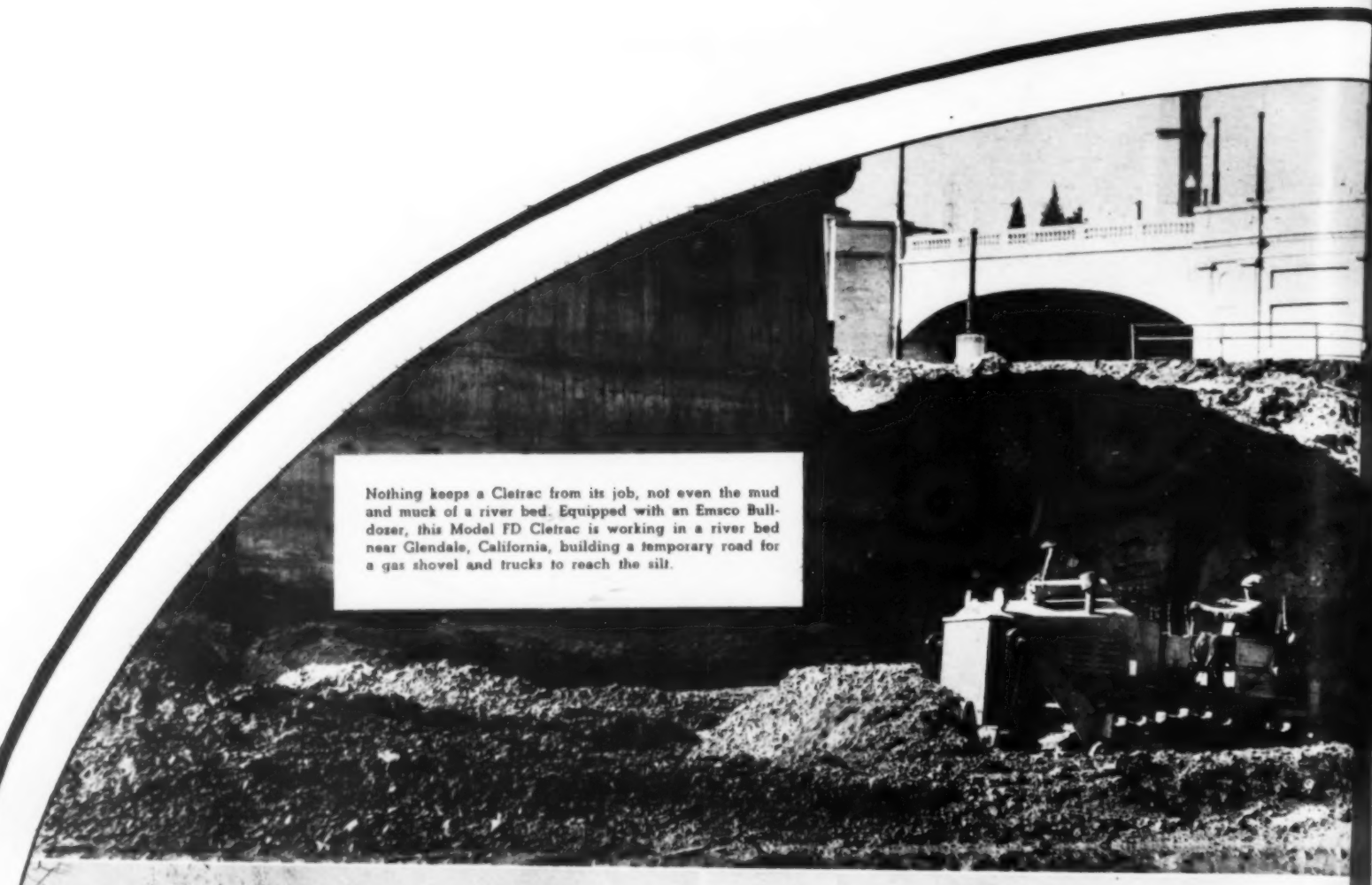


Hauling units step lively as this husky, fast-swinging Bucyrus-Erie 33-B dragline, owned by Harry T. Campbell, loads from a sand pit near White Marsh, Maryland. Quickly and easily convertible for all types of service, the modern 33-B tops the 1¼-yard field in output and economy. The 33-B is out ahead with greater speed, more power, and the strength and endurance that stands up to long, trouble-free performance in any kind of digging. It will pay you to investigate this 1¼-yard winner today!

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT

SOUTH MILWAUKEE, WISCONSIN, U. S. A.



Nothing keeps a Cletrac from its job, not even the mud and muck of a river bed. Equipped with an Emsco Bulldozer, this Model FD Cletrac is working in a river bed near Glendale, California, building a temporary road for a gas shovel and trucks to reach the silt.

Digging house basements, this Cletrac Model AG with Isaacson Bulldozer is moving approximately 200 yards of dirt in an eight-hour day at a fuel cost of less than 1 cent a yard. Typical Cletrac economy.

Making twelve trips an hour on a 100-yard haul, this Model D series Cletrac is handling close to 500 yards of dirt and rock each eight-hour day. Gasoline consumption is only 35 to 40 gallons a day.

Cletrac

Clet

REG. U.S PAT

Crawler T

GASOLINE OR

Built to E

Save

as much as 2 days in 30 with Cletrac Electric Starting Diesels

Experienced operators estimate that the time saved with Cletrac Electric Starting Diesels often totals as much as two days in thirty . . . two extra days' production without extra labor or overhead.

And logically so.

Cletrac Diesels, and the larger gasoline models, too, start at a touch of the button . . . just like a modern automobile. They're always ready to go. No delays. No hand cranking. No lost motion.

Consequently, with Cletrac Diesels your operators are hauling pay loads more quickly in the morning . . . building profits . . . keeping jobs up to schedule. Should the tractor stall in loading a scraper or in bulldozing — and what tractor doesn't — it takes only a couple of seconds to start it again . . . at a touch of the button. No jumping down off the tractor. No hand cranking. No climbing back again.

But electric starting is only one advantage of owning a Cletrac Diesel.

Consider the Controlled Differential steering that gives you finger-tip control . . . that simplifies handling . . . that assures you power on both tracks on the turns as well as on the straightaway.

Furthermore, because it's easier to balance load and tractor, Cletrac Controlled Differential Steering makes for a better, smoother job in such off-center loads as ditching, bulldozing, trailbuilding, snow removal.

Check the Cletrac . . . its sound, sturdy construction throughout . . . the built-in protection as standard equipment . . . the ease and simplicity of maintenance . . . the economy of operation. You'll join the thousands of others who are "going Cletrac." There's a size and model for every job, from 22 to 95 horsepower, either gasoline or Diesel.

The Cleveland Tractor Co., Cleveland, Ohio

Distributors in more than 125 principal cities

tract

Cletrac

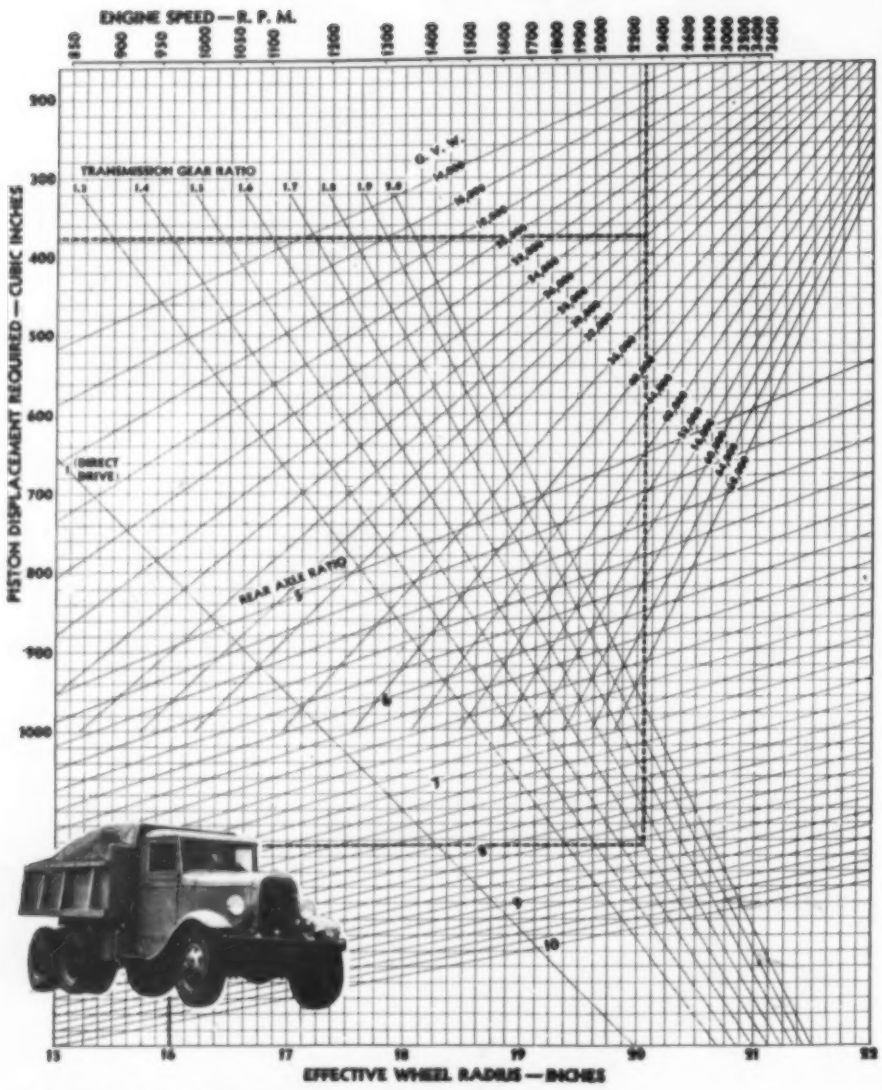
PAT. OFF.

Tractors

E OR DIESEL

t to Endure

Taking a 4% Grade *at 20 M.P.H.*



This Chart reproduced by courtesy of Commercial Car Journal.

The more you demand of your fleet, the more it demands of the lubrication it gets. It can be proved that you can reduce overhauling expense, get full power from your truck engines, if you will use New Texaco Motor Oil.

SOUNDS EASY, BUT . . .

● Simple as it seems, many of those fleet operators who participated in Commercial Car Journal's recent survey admitted that only part of their fleet could meet this ratio.

Even though your engines have sufficient piston displacement to do this, you can be sure of getting full power only when they are kept in top condition . . . clean . . . as they will be if you use New Texaco Motor Oil.

New Texaco Motor Oil is more than just another oil. It is refined by the Furfural Process . . . purified by furfural, a farm product made from corn, oats, cotton seed, etc. The Furfural Process frees oil from harmful tarry, gummy, sludge-forming elements. The result is an oil that is all lubricant, oil that keeps engines *clean,* rings and valves free, compression high, power output at peak!

Trained automotive engineers are available for consultation on the selection and application of Texaco Automotive Products. Prompt deliveries assured through 2108 warehouse plants throughout the United States . . . The Texas Company, 135 East 42nd Street, New York City.

★ ★ ★

By means of the chart at left, above, it is possible to find the piston displacement a truck engine must have in order that a truck of any gross weight may ascend a grade of 4 per cent at 20 m.p.h.

Locate on the bottom scale the point corresponding to the distance from the center of the driving wheel to the ground with the truck fully loaded. From this point proceed up to the point of intersection with the inclined line representing the rear-axle ratio.

From this point pass horizontally to the right (or left) to the point of intersection with the transmission-gear ratio, that is, the ratio of the particular gear in the transmission which must be used in order to make 20 m.p.h. up to the 4 per cent grade.

From this point pass vertically up (or down) until intersecting the inclined line representing the gross vehicle weight.

By passing from the latter point horizontally to the scale on the left side of the chart, you can read off the piston displacement required, whereas by passing vertically up to the scale at the top you can read off the speed at which the engine will turn over when the truck is making 20 m.p.h. in this gear.

Excerpts of article by P. M. Heldt, Engineering Editor, appearing on page 26 of Commercial Car Jrnl., Dec. '37.

TEXACO

NEW **TEXACO** *MOTOR OIL*

Outstanding Advantages from BOOM to ENGINE

. . . Northwest Welded Shovel Boom and Dipper Sticks.

. . . Northwest Alloy Steel Dragline Boom.

. . . Northwest Cushion-Clutch.

. . . Northwest "feather-touch" Clutch Control.

. . . Helical Engine Reduction Gears. Enclosed and running in oil.

. . . Ball or Roller Bearings on all High Speed Shafts.

. . . Uniform Pressure Swing Clutches.

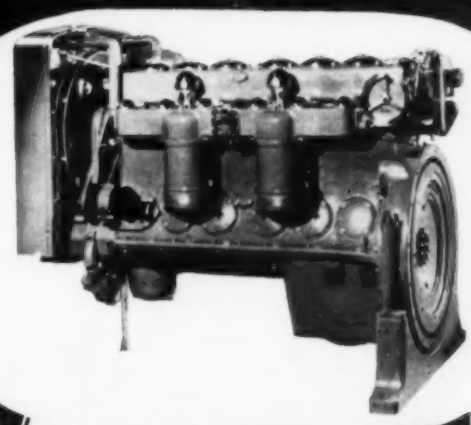
. . . Northwest Mobility — power on both crawlers at all times.

. . . Northwest Independent Crowd — simple — direct — powerful.

. . . Northwest simplicity of design and construction — low cost upkeep.

NORTHWEST
ENGINEERING CO.
1727 Steger Building
28 East Jackson Boulevard
Chicago, Illinois

These two Northwests are powered with Murphy Diesel Engines.



NORTHWEST

NOVO NEWS REEL

PAVEMENT BREAKER

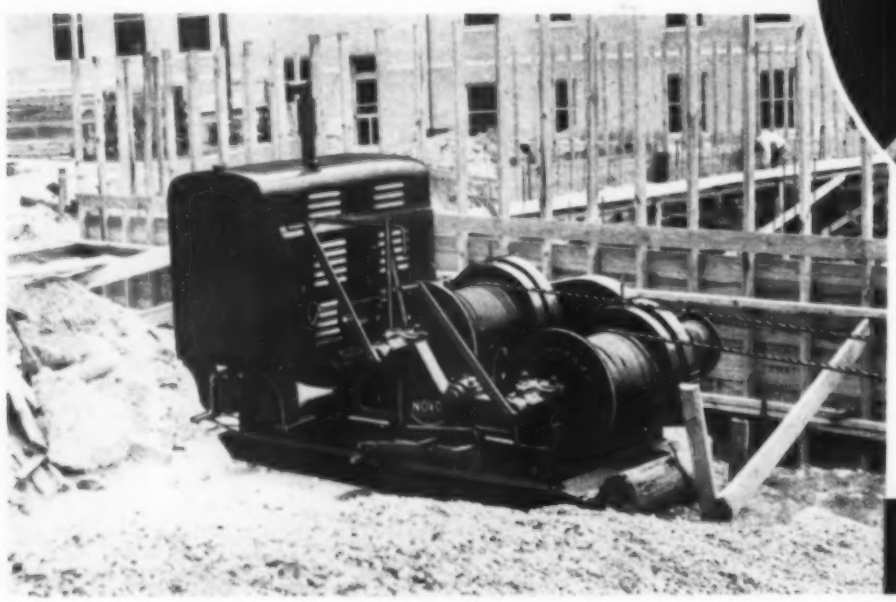
(Left) In London, England, this Novo Pavement Breaker is breaking 8" reinforced concrete under 2" of asphalt. An ancient earthenware sewer was only 8" below the pavement. Concrete was shattered so that it could be picked up with a 1 yd. shovel, yet no damage was done to sewer. J. Cowen Hulbert of London.

WELL POINTS

(Right) Clinging to the bank like a couple of mountain goats, these two Novo 4" Self-Primers are dewatering 40 well points on a grade separation job on which a pumping station must be installed. US Route #16 at Howell, Michigan. Job completely surrounded by spring lakes and in water bearing sand. Contractor L. A. Davidson. Send for Pump literature: Self-Priming — Pressure — Diaphragm & Road Pumps.

HOSPITAL ADDITION

(Below) The Seeley Hospital addition job at Galveston, Texas, had this Novo 2 drum, Model WH Hoist to lift all materials. It is silent chain drive — equipped with "feather-touch" controls — self-energizing brakes and built-in safety features. Contractor J. E. Morgan and Sons, Galveston. Send for literature on any size Novo Hoist.

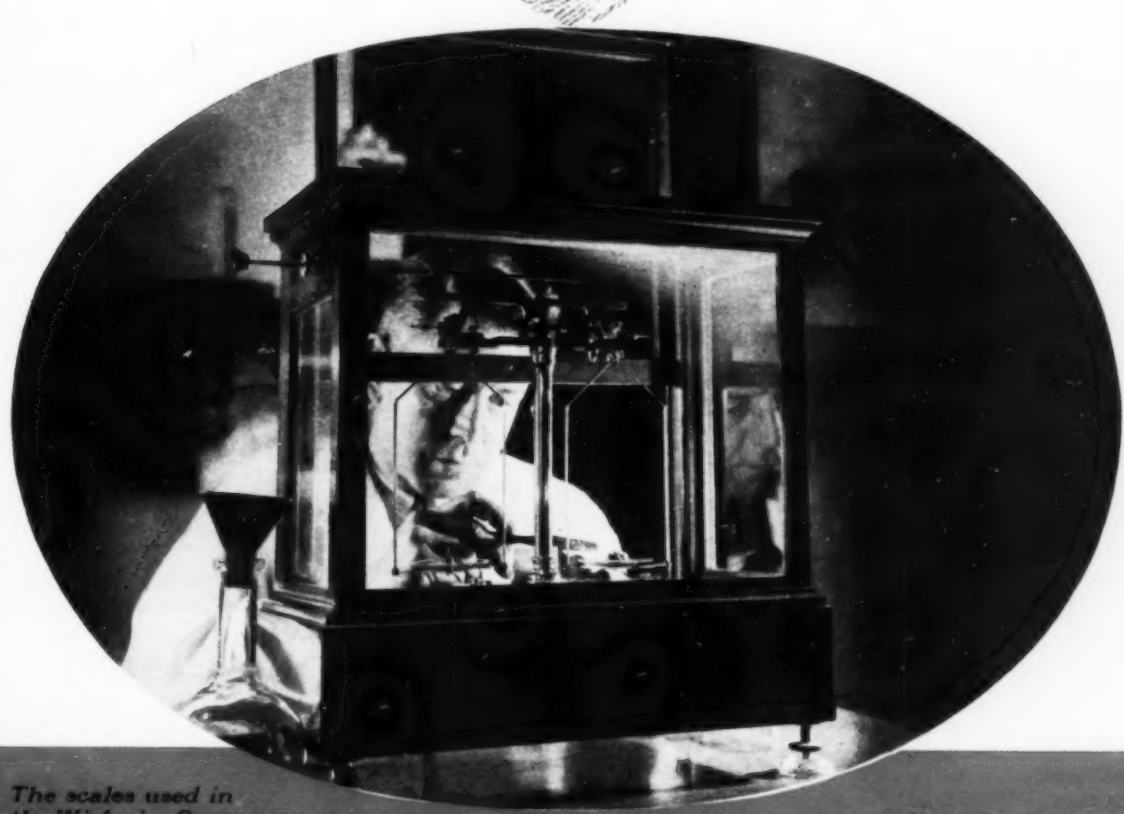


DISPOSAL PLANT

(Above) Novo 3" Self-Primer powered with 7½ H.P. electric motor used on the new disposal plant, Lansing, Michigan. Pump has been giving almost night and day service for 5 months. Contractor Patterson Engineering Co., Detroit. Send for literature.

NOVO ENGINE CO.
214 Porter St. Lansing, Mich.

SCALES that can weigh THUMB PRINTS



The scales used in the Wickwire Spencer testing laboratories are so sensitive that extreme care must be exercised to prevent finger prints from being deposited on the polished trays after loading.

ARE USED IN BUILDING WICKWIRE ROPE LIFE "BEYOND SPECIFICATIONS"

Absolute precision weighing of the chips bored from sample steel ingots is necessary to accurately determine the presence of various substances that govern the qualities of rope steel. Even a tiny heap, the size of that shown on the scales, of certain non-ferrous materials will change the whole characteristics of a reel of wire rope weighing several tons. So control them we must to build quality into Wickwire Spencer Wire Rope . . . beyond specifications.

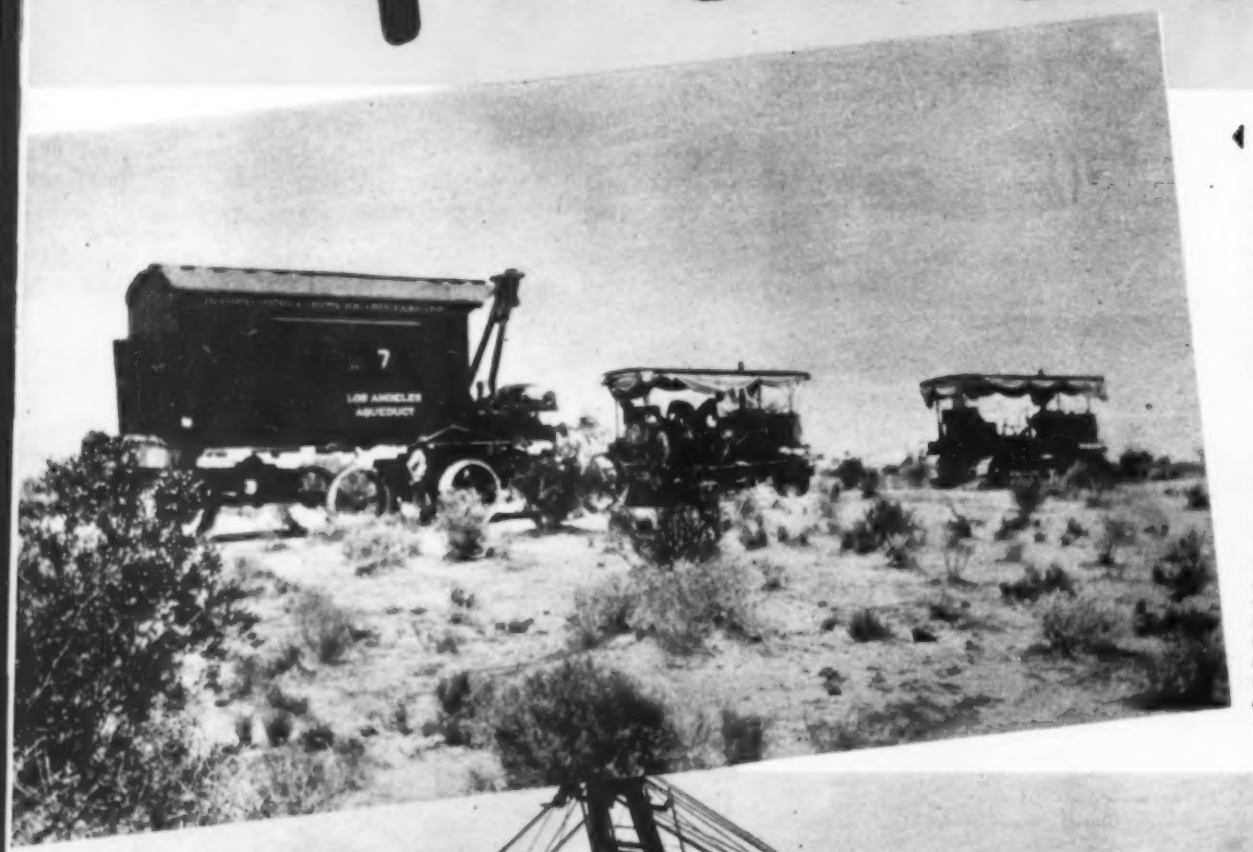
It is still the privilege of the progressive manufacturer to build rope life into his product beyond official specifications.

WICKWIRE SPENCER STEEL COMPANY

General Offices: 41 E. 42nd St., N.Y. Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; Export Sales Dept.: New York. WICKWIRE SPENCER SALES CORP., New York, Chattanooga, Tulsa, Portland, Seattle

WICKWIRE ROPE

Aqueducts



THEN

ABOUT 1909 **. . . "Caterpillar" track-type Tractors were beginning to revolutionize construction-work. Here are two Holt 75s (Holt later united with Best to form the Caterpillar Tractor Co.) working across the desert on the Los Angeles Aqueduct. . . . A large fleet of these machines was used on this job! Each had about 65 drawbar horsepower . . . consumed about 6½ gallons of gasoline an hour . . . traveled about 2.1 miles per hour.**

AND NOW

TODAY **. . . "Caterpillar" Diesel track-type Tractors carry on the work of giving more speed, power and economy to construction—but to a greater degree than in 1909! Here are three, in the heart of the desert—near Rice, California—hauling a giant electric shovel belonging to the Barrett & Hilp & Macco Corporation. They are moving up 35 miles to a new site on the Colorado River Aqueduct which will bring water to Los Angeles.**

ACROSS THE DESERT

What a difference a few years make!

In the small photograph on the opposite page, you see two of approximately 130 "Caterpillar" track-type Tractors which helped build the Los Angeles Aqueduct! Those were some of the earliest of these machines to put in an appearance on the world's big construction-work . . . to give their power, traction, strength and durability to difficult jobs in difficult places, *then as now.*

This picture was taken about 1909 . . . the year of Halley's Comet . . . before there was any radio . . . when the Singer Building in New York City was still towering above all others.

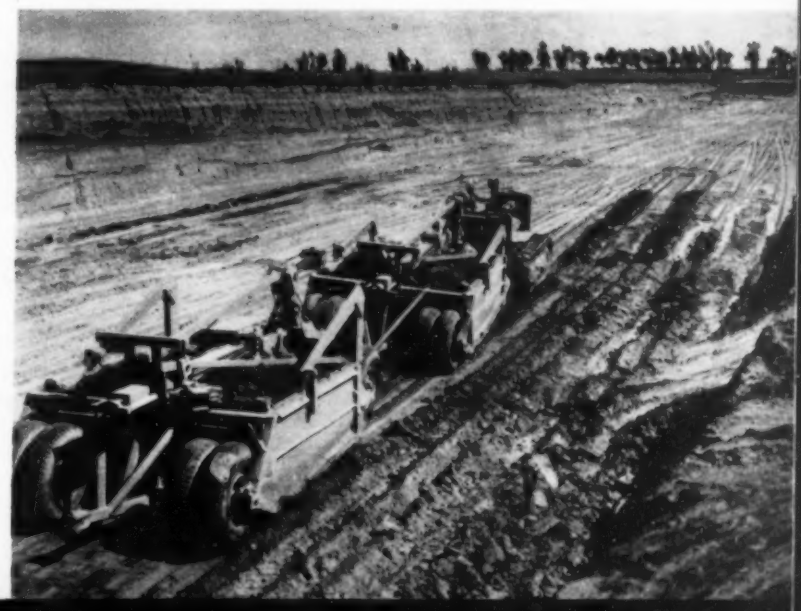
But what a difference a few years make! There has been progress in all fields. And "Caterpillar" track-type Tractors have more than kept pace with progress. Look at the larger picture, also on the opposite page. Here are three "Caterpillar" Diesel Tractors, of today, on an aqueduct job . . . helping bring water to Los Angeles . . . as their ancestors did, about 1909.

Everything has changed—and changed for the better! Yet the machine of *today* could not be as great as it is, if the machine of *yesterday* had not been great too! In other words, the "Caterpillar" Diesel Tractor of 1938 is built on a firm foundation that reaches back over the years.

You know these machines too well—by reputation or personal experience—to require a detailed explanation of their qualities. But let us remind you of a few things they offer. There are five sizes ranging from 25 to 95 drawbar horsepower. They're noted for their accurate governing . . . quick responsiveness . . . and freedom from delicate checks and balances. They've made a world-wide record on fuel-economy and dependability. *Wherever power is needed, they're the most widely used—the most highly respected!*

DUST LIKE THIS—or even worse—doesn't bother the vital parts of a "Caterpillar" Diesel Tractor! Self-lubricating, self-adjusting seals guard its final drive. These are one of the greatest developments in tractor history! They keep dirt out and oil in. The machine shown here is working on 12 miles of levees in the Sacramento Valley. Using a Le Tourneau Carryall, it consumes only 4½ gallons of 6c fuel per hour. Makes 6 trips an hour—½ mile round trip. Works 24 hours a day.

HERE'S LONG LIFE FOR YOU! Over a million yards of material are moved every year by the owner of this "Caterpillar" Diesel Tractor. He has six in addition to this—in all, a fleet of seven. All but one (a new machine) have operated more than 10,000 hours!



CATERPILLAR

TRACTOR CO., PEORIA, ILL.

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

Another record year in prospect for *Architectural Concrete* jobs

The Randall Motor Club building, Los Angeles, owned by E. Brooks Randall & Sons; G. Stanley Underwood, architect. Frank L. Froley, Beverly Hills, contractor. Walls, floors and decorative details are of concrete.

ARCHITECTURAL CONCRETE is very much "in the air" around architects' offices these days. Big industrial corporations, small retailers, public officials and other buyers of new buildings . . . have been impressed with concrete's practical advantages of good looks at low cost, firesafety, rigidity, long life with low maintenance.

With Architectural Concrete, walls are *not* put up after the framing, but cast *integral* with frame and floors. Ornament is largely a matter of forming, and so is wall texture.

There is a construction technique by which contractors can erect beautifully formed walls of high quality, weather resistant concrete at low cost. Details are outlined in free manual, "*Forms for Architectural Concrete.*" Send for your copy today.

PORTLAND CEMENT ASSOCIATION

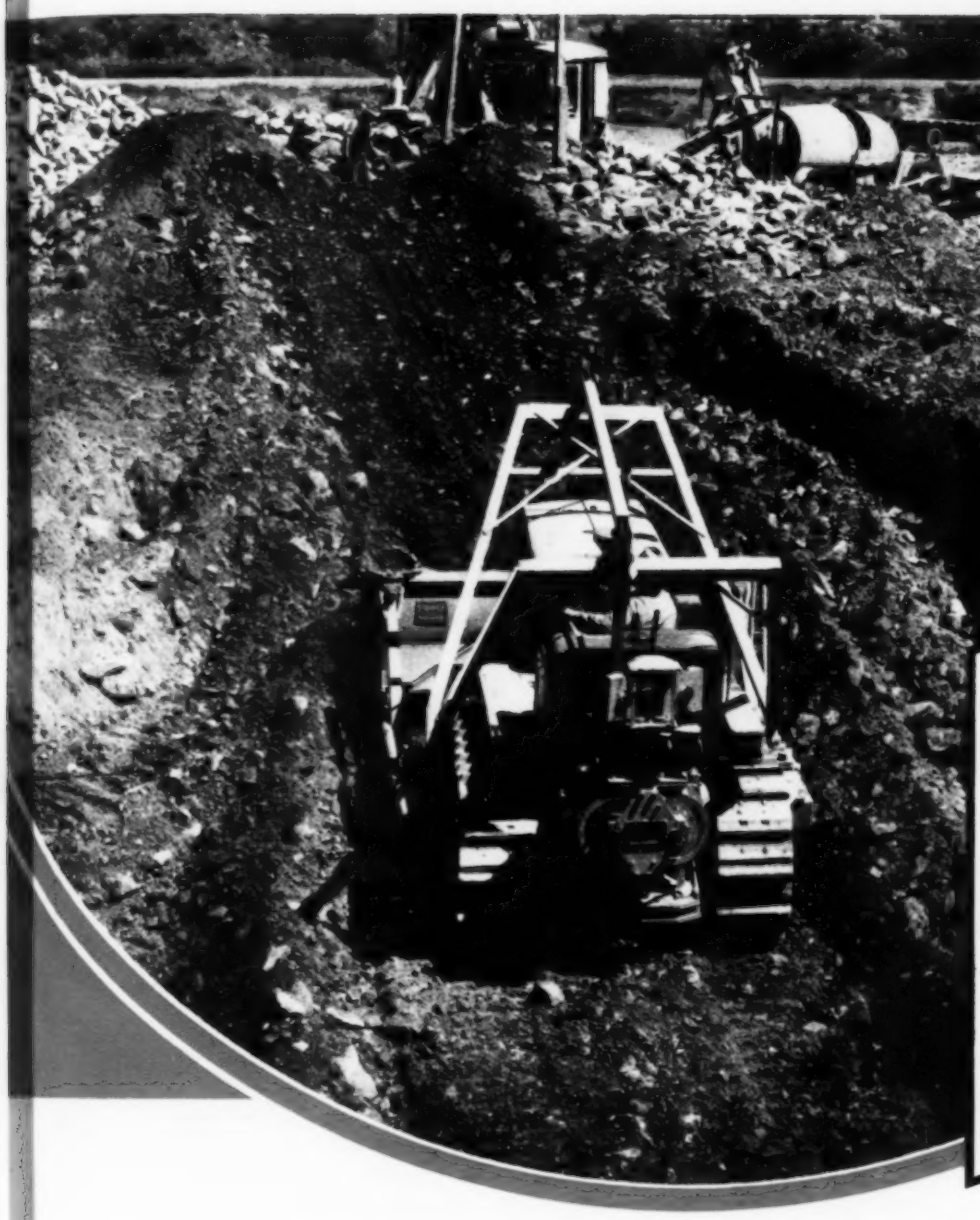
Dept. A3-16, 33 W. Grand Ave., Chicago, Ill.

A National Organization to Improve and Extend the Uses of Concrete

Architectural Concrete

WALLS AND ORNAMENT CAST INTEGRALLY WITH FRAME AND FLOORS

More "RPM" Diesel Engine Lubricating Oil is being sold and used in "Caterpillar" Diesel Engines than all other Diesel oils combined



RPM
REG. U.S. PAT. OFF.
DIESEL ENGINE LUBRICATING OIL

LOOK FOR THIS NAME

"RPM" Diesel Engine Lubricating Oil is distributed by the following companies under the brand names indicated:

IN THE UNITED STATES

"RPM" Diesel Engine Lubricating Oil:
THE CALIFORNIA COMPANY (Montana only)
THE CARTER OIL COMPANY, Tulsa, Oklahoma
HUMBLE OIL & REFINING COMPANY
STANDARD OIL COMPANY (Indiana)
STANDARD OIL COMPANY (Inc. in Kentucky)
STANDARD OIL COMPANY (Nebraska)
STANDARD OIL COMPANY OF CALIFORNIA
STANDARD OIL COMPANY OF TEXAS
UTAH OIL REFINING COMPANY

Diol "RPM" Diesel Engine Lubricating Oil:
COLONIAL BEACON OIL COMPANY, INC.
STANDARD OIL COMPANY OF LOUISIANA
STANDARD OIL COMPANY OF NEW JERSEY
STANDARD OIL COMPANY OF PENNSYLVANIA

Signal "RPM" Diesel Engine Lubricating Oil:
SIGNAL OIL COMPANY

Sohio "RPM" Diesel Engine Lubricating Oil:
THE STANDARD OIL COMPANY (Ohio)

IN CANADA

"RPM" Diesel Engine Lubricating Oil:
IMPERIAL OIL LIMITED
STANDARD OIL COMPANY OF BRITISH COLUMBIA LIMITED

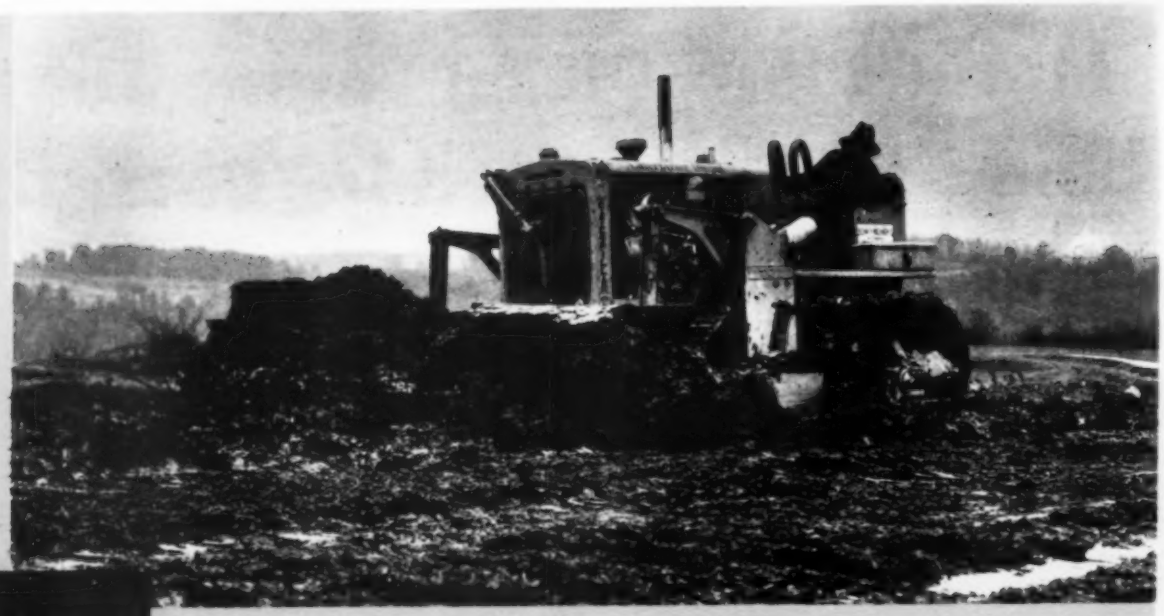
The "RPM" trade-mark appears on every container of genuine "RPM" Diesel Engine Lubricating Oil. It is your assurance of superior lubrication.

Approved by
CATERPILLAR TRACTOR CO.

THROUGHOUT THE WORLD

"RPM" Diesel Engine Lubricating Oil is also available through distributors in more than 100 other countries.

STANDARD OIL COMPANY OF CALIFORNIA



LAPLANT-CHOATE MEANS Lower Costs

LaPLANT-CHOATE TRAILBUILDERS

with Positive Finger-tip Hydraulic Control

Note that structural design gives operator unimpaired vision. This assures safe, accurate and easy operation.

Complete, competent service facilities are available from any of the hundreds of "Caterpillar" dealers.

Give you

- **More Economical Uses**
- **More Work—Better Work**
- **Lower Costs Per Yard Moved**

The way to increase your profits and land more contracts is to accomplish more work per day at lower operating costs. To do this, your equipment must perform many operations . . . not just one . . . and do clean, thorough work in as few operations and in as short a time as possible. And that is exactly what the famous LaPlant-Choate Trailbuilders are doing on all types of earth moving jobs the world over. These sturdy, trouble-free Trailbuilders, designed and built by pioneers in this field, perform practically every earth-moving operation. They push, dig, clear, level, spread, fill and backfill. Because these units, like all LaPlant-Choate earth-moving and handling equipment, have modern, reliable, effortless hydraulic control, you get such operating advantages as rigid down pressure to make the blade dig; positive locking of the blade in any position and fast, accurate control for fine work. The incompressibility of the hydraulic fluid makes response positive and unfailing, yet without shock. LaPlant-Choate Trailbuilders are designed exclusively for use on all models of "Caterpillar" track-type tractors, thus assuring you of a balanced, coordinated unit that will perform satisfactorily even under the most adverse weather or ground condition. It will pay you to get full details at once from your nearest "Caterpillar" dealer. Write us today for free circular.

TAMPING ROLLERS
SCRAPERS • BULLDOZERS

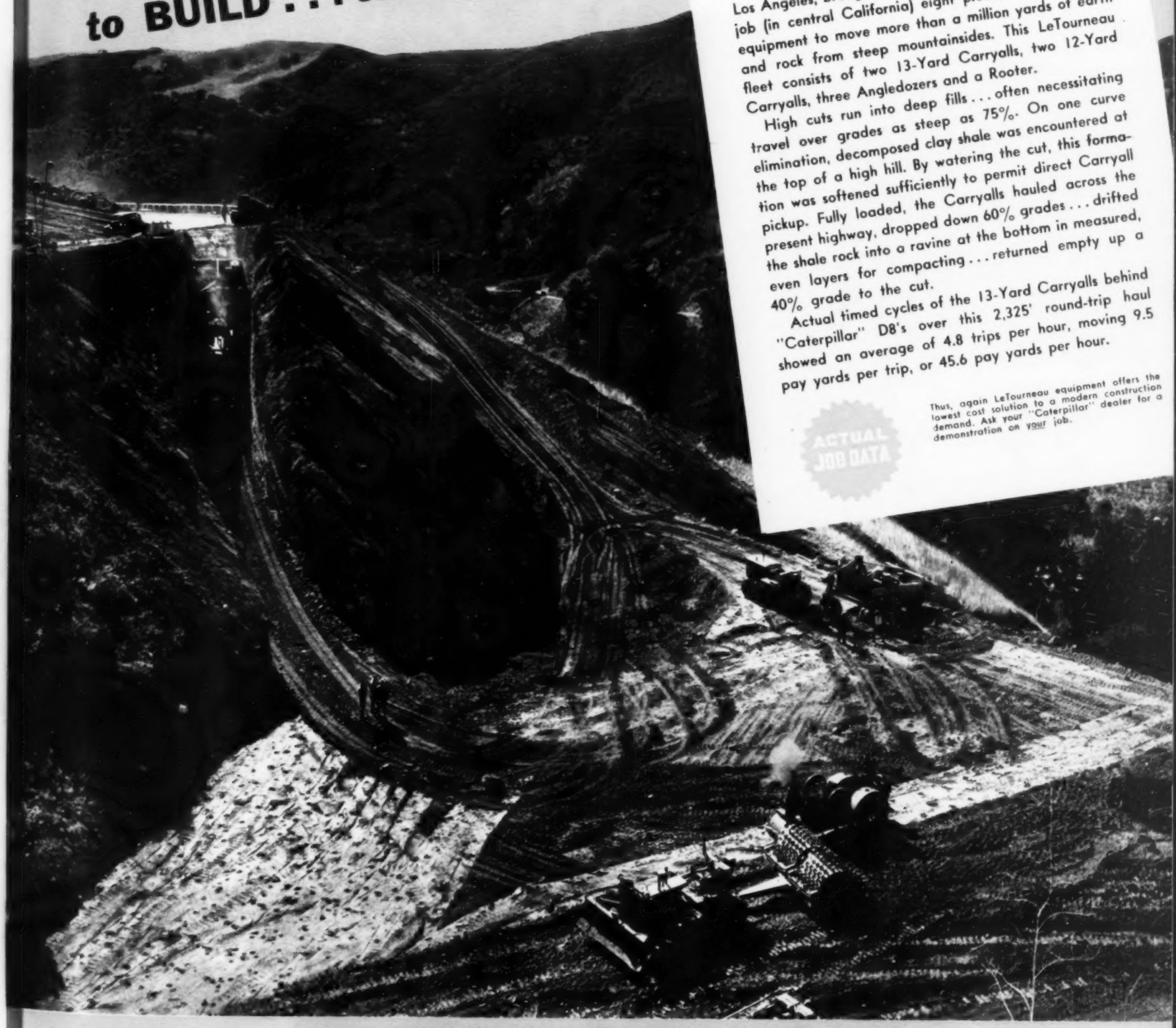
LA PLANT-CHOATE MANUFACTURING CO. Inc.

CEDAR RAPIDS, IOWA.

RUBBER WHEELED WAGONS
BRUSH CUTTERS • SNOW PLOWS

THE NEW CUESTA GRADE

EASIER to DRIVE . . . to BUILD . . . to PAY FOR



Today's demands for "super" highways would have been fantastic a few years ago. Cost alone prohibited their construction. But that's all changed. LeTourneau set new standards for figuring jobs . . .

For instance, Metropolitan Construction Company, of Los Angeles, brought to the Cuesta Grade realignment job (in central California) eight pieces of LeTourneau equipment to move more than a million yards of earth and rock from steep mountainsides. This LeTourneau fleet consists of two 13-Yard Carryalls, two 12-Yard Carryalls, three Angledozers and a Rooter.

High cuts run into deep fills . . . often necessitating travel over grades as steep as 75%. On one curve elimination, decomposed clay shale was encountered at the top of a high hill. By watering the cut, this formation was softened sufficiently to permit direct Carryall pickup. Fully loaded, the Carryalls hauled across the present highway, dropped down 60% grades . . . drifted the shale rock into a ravine at the bottom in measured, even layers for compacting . . . returned empty up a 40% grade to the cut.

Actual timed cycles of the 13-Yard Carryalls behind "Caterpillar" D8's over this 2,325' round-trip haul showed an average of 4.8 trips per hour, moving 9.5 pay yards per trip, or 45.6 pay yards per hour.

ACTUAL JOB DATA

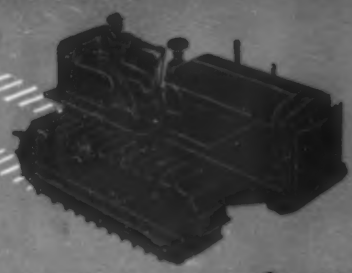
Thus, again LeTourneau equipment offers the lowest cost solution to a modern construction demand. Ask your "Caterpillar" dealer for a demonstration on your job.

LETOURNEAU

R. G. LeTOURNEAU, INC., • Peoria, Illinois • Stockton, California • Cable Address: "Bobletorno"

Manufacturers of: Angledozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedozers.

*Name Registered U. S. Patent Office.



A NEW DIESEL ENGINE LUBRICANT

APPROVED

BY

CATERPILLAR TRACTOR CO.

CADEL

DIESEL ENGINE LUBRICANT

AFTER 2000 HOURS IN ACTUAL OPERATION CADEL SHOWS THESE AMAZING RESULTS

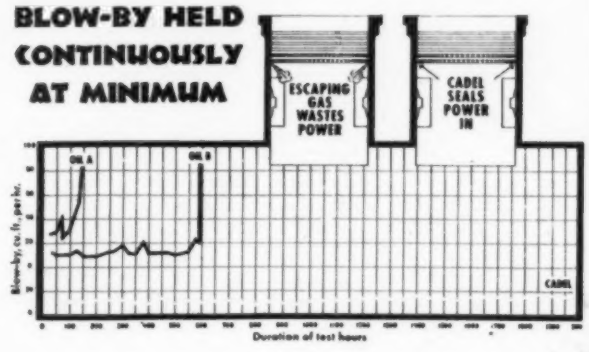
RINGS AND PISTON STILL BRIGHT AND CLEAN

RING WEAR PRACTICALLY ELIMINATED BY CADEL

OIL CONTROL RINGS STILL FREE OF SLUDGE

NO POWER LOSS

BLOW-BY HELD CONTINUOUSLY AT MINIMUM



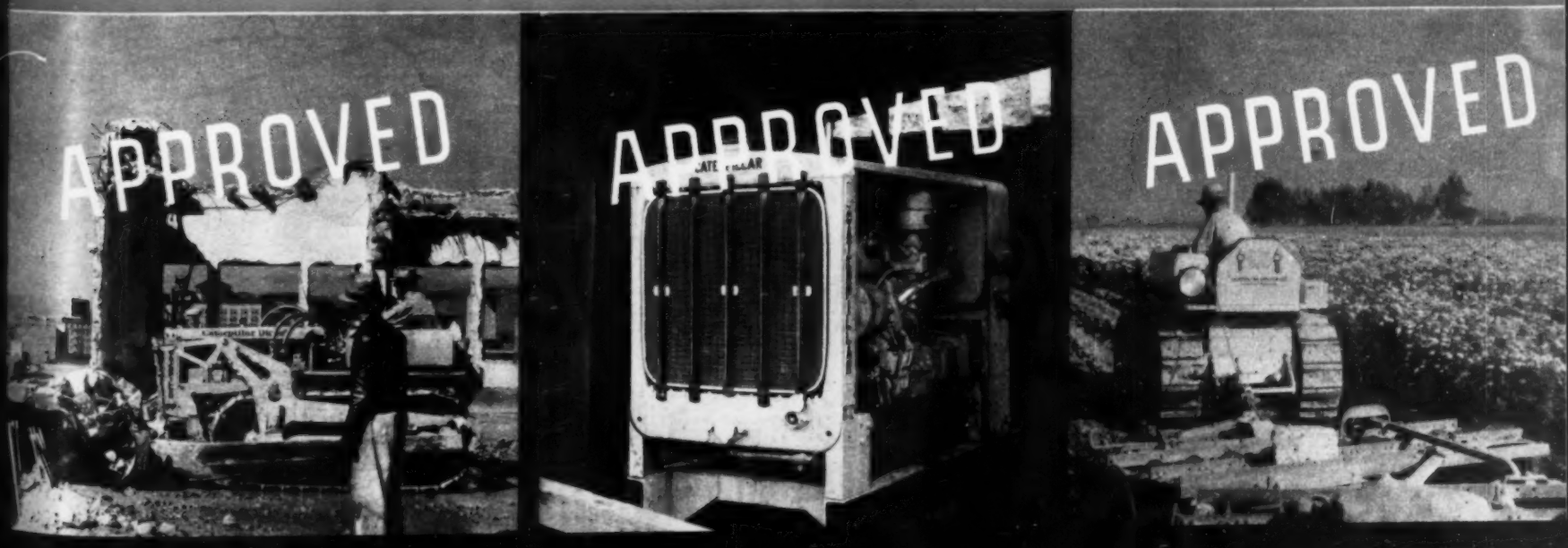
CADEL IS BALANCED TO GIVE "CATERPILLAR" DIESEL USERS:

1. complete protection thru high film strength.
2. resistance to ring sticking.
3. low cylinder and ring wear.
4. assurance of open oil channels and free acting oil controls.
5. low blow-by of gases in crankcase.
6. clean rings and cylinder walls.
7. economical oil consumption.

TIDE WATER ASSOCIATED OIL COMPANY

SAN FRANCISCO, CALIF. NEW YORK, N. Y.

ASK YOUR "CATERPILLAR" DEALER WHERE CADEL IS SOLD IN YOUR NEIGHBORHOOD



THESE "QUESTION MARKS" COST YOU REAL MONEY

Engineered for One Purpose: To Carry Loads

Athey Forged-Trak 2-Way Dump Trailers have none of the weaknesses of equipment that attempt to combine motive power and load carrying. The double-husky strength of rigid frames mounted on railroad type springs—and bodies and wheels built to withstand the loading shocks of the biggest dippers, eliminate the extra maintenance costs of less sturdy equipment.

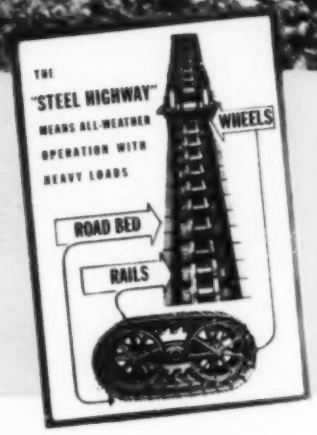
No Costly Road Preparation and Maintenance

You don't have to spend money making a road for Athey Forged-Trak 2-Way Dump Trailers. You don't have to maintain a road maintenance crew. Athey Forged-Trak Units, laying their own rails on their own firm road-bed, actually tend to improve haul roads—not tear them up.

Longer Hauling Life

Athey Forged-Trak Units have the most accurately predeterminable life of any hauling unit under a given set of job conditions—because they have the strength to withstand loading and roading shocks . . . because the Athey Forged-Trak Wheel overcomes the costly roadway hazards of sharp rocks, roots, stumps, slippage and overload caused by uneven roadways and loading by large dippers . . . because they can operate under adverse conditions in any season of the year.

Get Rid of Them with Athey Forged-Trak 2-Way Dump Trailers



Do you know *exactly* how much it is costing you to haul your loads? For instance, have you figured in the cost of road maintenance . . . the cost of repairing and maintaining equipment that cannot "take it" . . . the heavy toll which bad ground and weather conditions take from ordinary hauling units? You will get rid of these costly "question marks" when you haul with Athey Forged-Trak 2-Way Dump Trailers. You will *know*, in advance, what the costs are going to be. You will be sure of steadier production and greater profit on the job. See your "Caterpillar" dealer or write us.

ATHEY TRUSS WHEEL CO.
5631 West 65th Street, Chicago, Ill.
Cable Address: "Trusswheel," Chicago

ATHEY
Forged-Trak
Reg. Trade-Mark
2-WAY DUMP TRAILERS

FIVE YEARS AHEAD OF THE FIELD

WHO SAYS "IT CAN'T BE DONE?"

A full ¾ yd. machine . . . alloy steel, all welded construction with useless dead weight eliminated. This means greater sturdiness — faster operating—higher daily production. And you get the world's most successful means for machine travel . . . true Tractor Type Crawlers. The hundreds and hundreds of P&H users of all-welded alloy steel excavators in the past five years is convincing evidence that it can be done.

Watch Others Follow P&H Design

Send for bulletin X-42 giving complete information on the finest, fastest, ¾ yd. excavator ever built.

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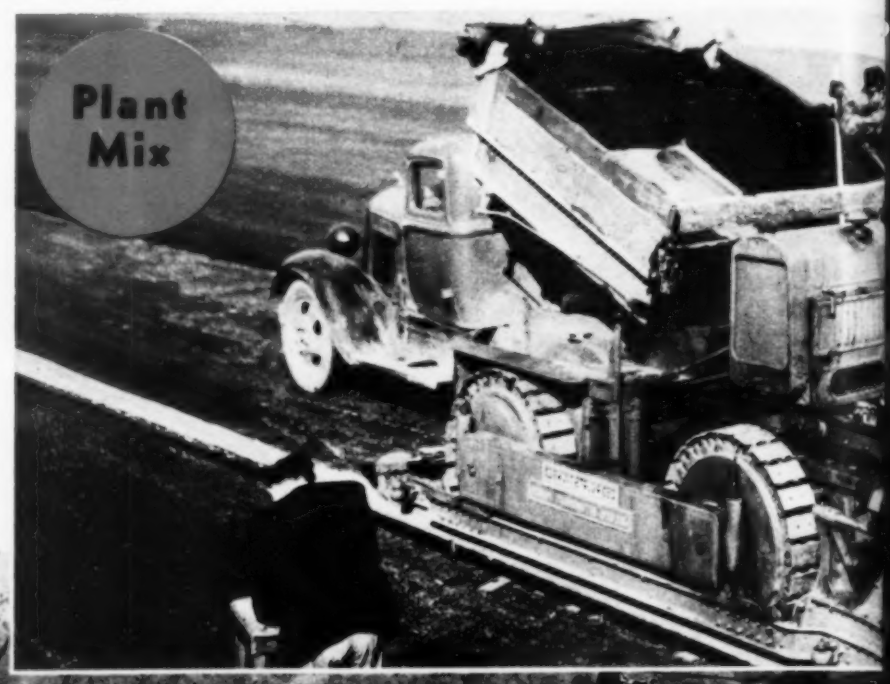
First choice

of Paving Contractors

More Jaeger Spreading and Finishing Machines are Used, the World Over, Than Any Other Kind--



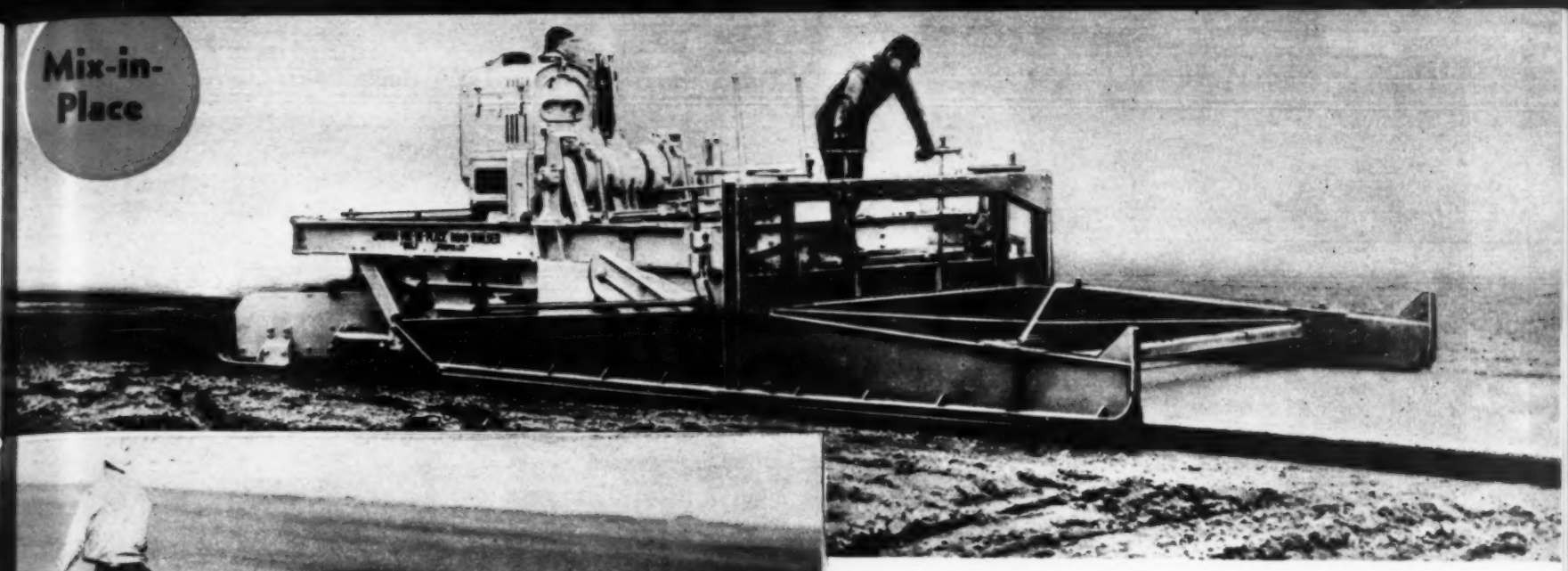
JAEGER AUTOMATIC FINISHER

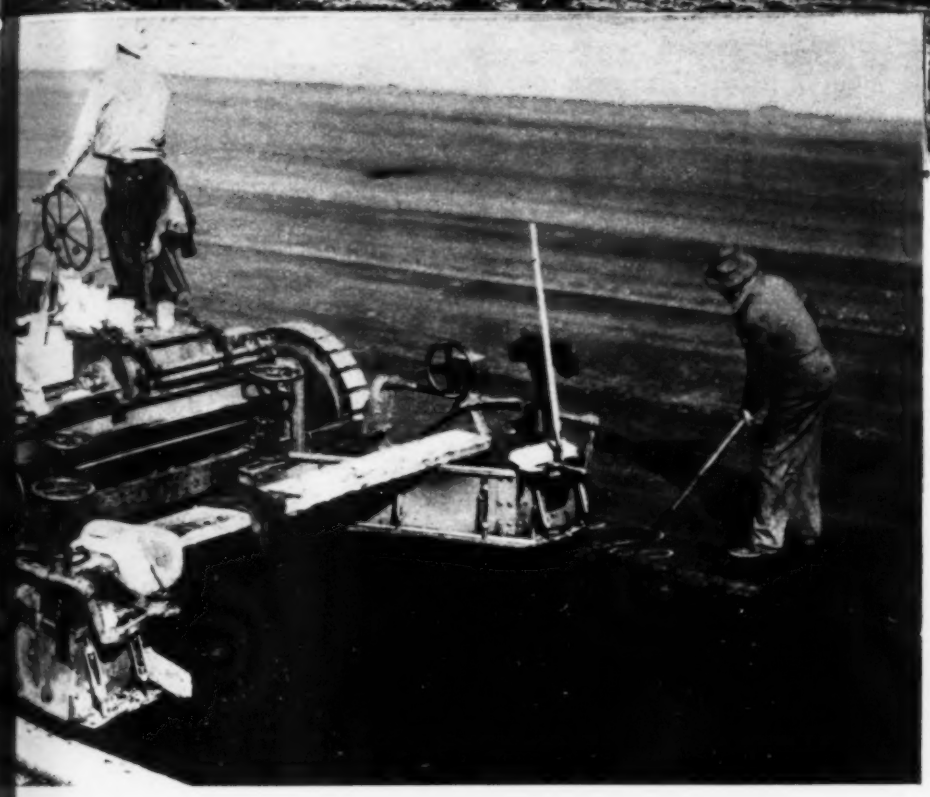
for Highest Type Concrete or Bituminous

Combines maximum speed and finishing capacity with "Velvet Touch" Screeding—precision smoothness for the engineer, low cost production for the contractor. Years ahead in design with Automatic Power Lift, Box-Type "Velvet Touch" Screeds, Differential Steering, Adjustable Telescopic Frame, Gas or Gas-Electric Power.

Jaeger Vibratory Finisher, with exclusive DEEP INTERNAL VIBRATION, is recognized as the original and successful method —saves up to 15% of cement, allows use of local aggregates. Write for details.

PUMPS HOISTS·TOWERS





JAEGER MIX-IN-PLACE ROAD BUILDEI

for ALL TYPES of Retread and Stabilized Base!

One pass of this Self-Propelled Road Builder mixes, spreads and smoothl finishes, ready for final rolling—a better mixed, longer lasting road du to twin pug mill mixing, a smoother riding road due to the 21 ft. straigl edge levelers, a lower cost job because one machine mixes and finishe IN ONE PASS. Also built in popular priced tractor-drawn model fc light retread and stabilization.

BITUMINOUS RETREAD:

Can be used with Spreader-Finisher, as shown, or as traveling pug mill only. At Elbow Lake, Joe Miseu, Crosby, Minn., Contr., mixed retread for 24 ft. road, 1" compacted, at rate of 18 ft. per minute.

BITUMINOUS STABILIZED BASE:

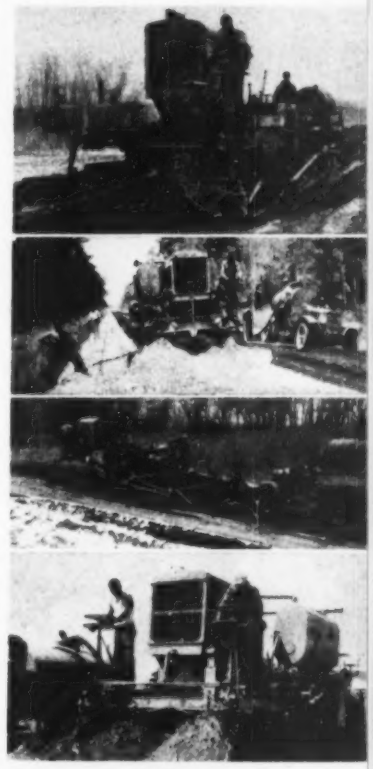
Cutting to staked grade and mixing material for 5" base, 22 ft. wide, in two parallel passes—near Ravenels, S. C. C. G. Fuller, Barnwell, S. C., Contr.

CLAY-GRAVEL STABILIZATION:

Building base for 22 ft. road near Peoria, Ill., in two courses each 3" compacted thickness. Mid-Continent Engineering Co., Chicago, Ill., Contrs.

AIRPORT STABILIZATION WITH BITUMELS:

Mixing, spreading and finishing 150 ft. lanes in 10 ft. widths, 4" compacted thickness, at Akron, Ohio Municipal Airport. East Akron Supply Co., Contrs.

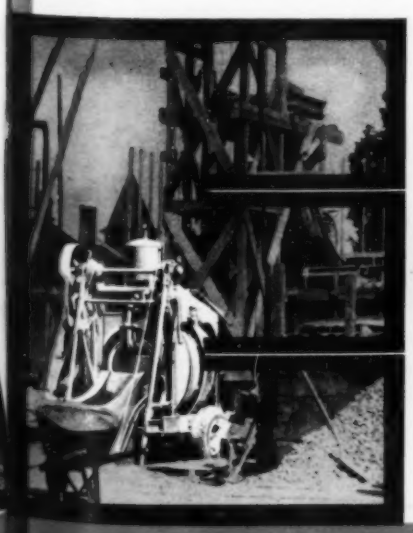


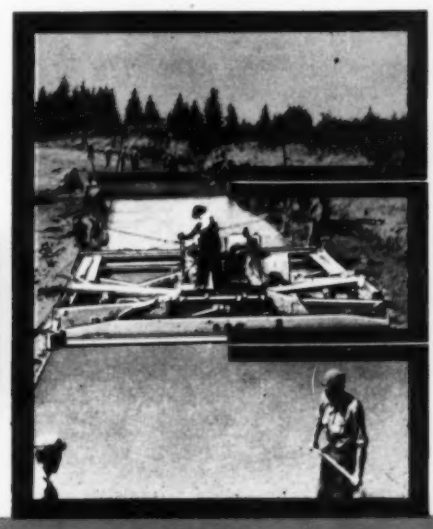
JAEGER BITUMINOUS PAVER

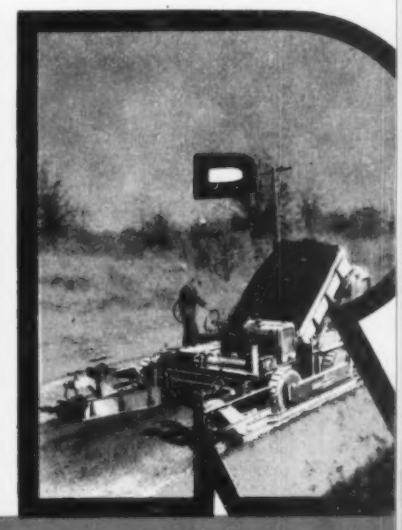
Preferred by engineers and contractors because it puts no weight or traction on the newly laid material (no rollers to prematurely seal emulsion or cause creeping or tearing of soft surface)—and because it lays a smoother surface (equalized by 17 ft. straight edge levelers)—any width to 14 ft. —faster than most plants can mix material. Frame is telescopic, with Adjustable Blenders for quick width changes, curve widening, irregular street widths and paving flush to curb. Heated Screeds (an exclusive Jaeger feature) and Power Shut-Off Gates in hopper, if desired.

Send for Latest Complete Paving Catalog and Prices

THE JAEGER MACHINE CO., 800 DUBLIN AVE., COLUMBUS, OHIO

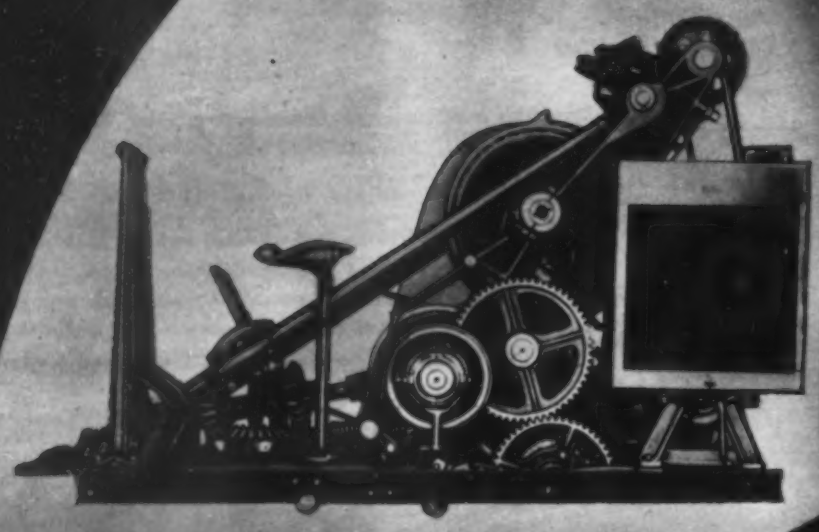




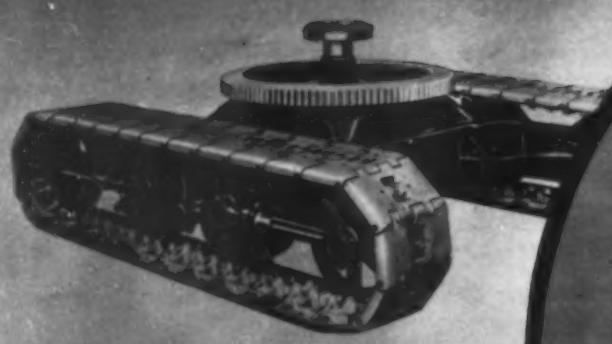


MIXERS **TRUCK MIXERS** **MODERN PAVING EQUIPMENT**

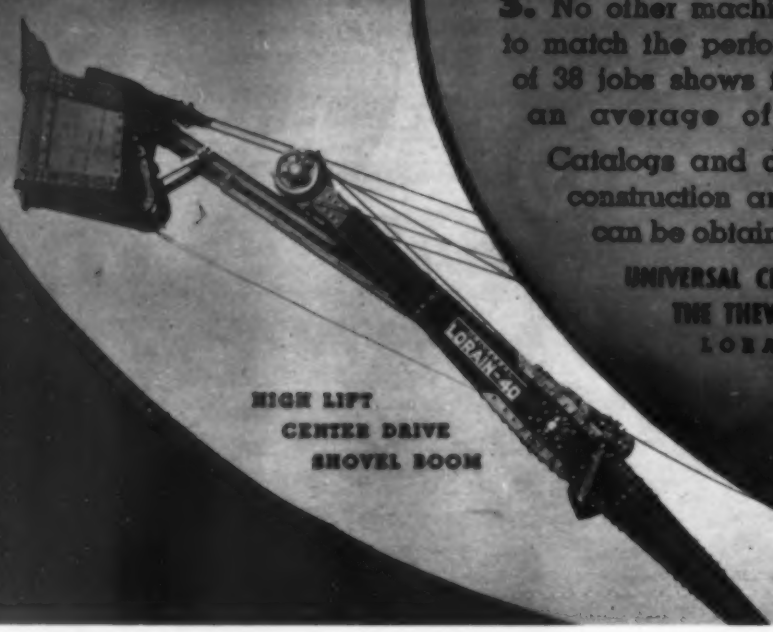
The Most Copied 3/4 YD. SHOVEL IN AMERICA



CENTER DRIVE
TURNTABLE WITH PATENTED
SLOPING MACHINERY FRAME



3 SPEED CENTER DRIVE CRAWLER



HIGH LIFT
CENTER DRIVE
SHOVEL BOOM

Like all products which successfully pioneer new fields, the ¾-yd. Lorain-40 shovel is not without its imitators. But the contractor who has an eye for real values will have no difficulty in spotting the "original" because—

1. No other machine on the market has the patented sloping machinery frame—the greatest single factor in obtaining maximum capacities at minimum weight.

2. None of the machines following in the footsteps of the Lorain-40 have been as thoroughly proved and tested by 5 years of contractor service and millions of yards of excavation.

3. No other machines have demonstrated their ability to match the performance record of this unit. A survey of 38 jobs shows the ¾-yd. Lorain-40 has maintained an average of 89 yards per hour.

Catalogs and data on Lorain-40 construction and performance can be obtained by writing

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THEW CENTER DRIVE
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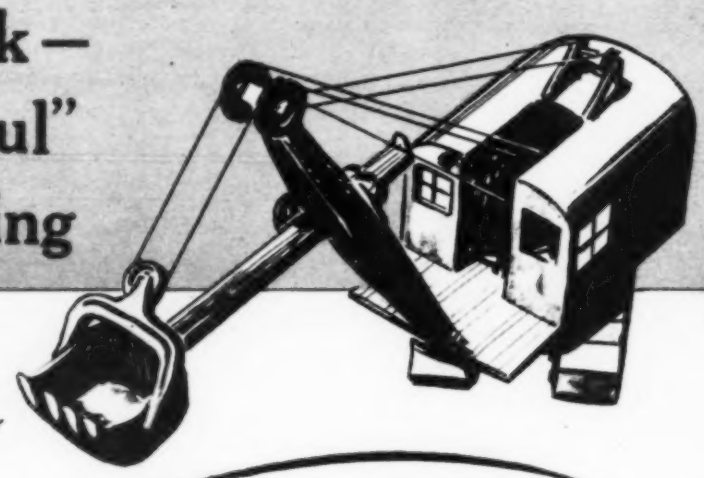
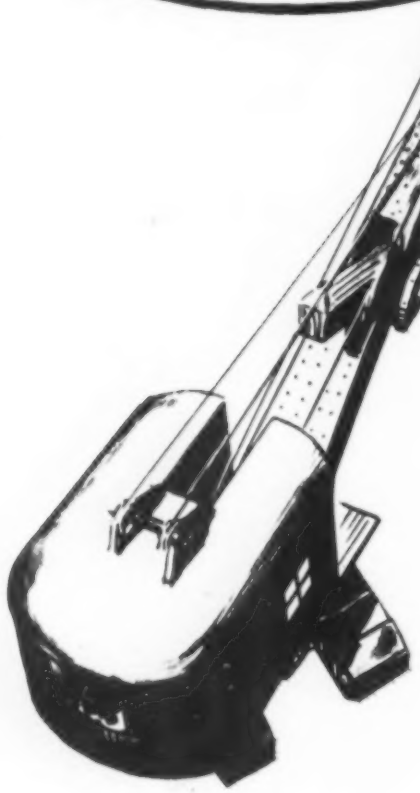
LORAIN-40

If Shovels Could Talk— they'd "say a mouthful" in favor of good blasting



I'M ALL TIRED OUT ...AND I ONLY HANDLED 36 CUBIC YARDS PER HOUR ALL DAY

BOY, I FEEL FIT AS A FIDDLE...AND MY DAY'S RATE OF PRODUCTION WAS 67 CUBIC YARDS PER HOUR



Consider the case of two 1-yard shovels— each with an average operating cost of $21.00 per hour for loading, hauling and dumping.

One, working with *well blasted rock*, showed an average production rate of 67 cubic yards per hour at a cost of only 31⅓c per yard.

The other, working with *poorly blasted rock*, handled only 36 cubic yards per hour at a cost of 58⅓c per yard.

What made the difference? Blasting! And—what makes blasting good or bad? The explosive!

ATLAS GELODYNS for example! Gelatin performance at lower costs. Only slightly less water resistance than Gelatin. Time and again, Gelodyns can be substituted for ammonia gelatins *stick for stick. And—Atlas Gelodyns cost 18% less per stick.*

Ask the Atlas Representative to arrange a Gelodyn demonstration on your job.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

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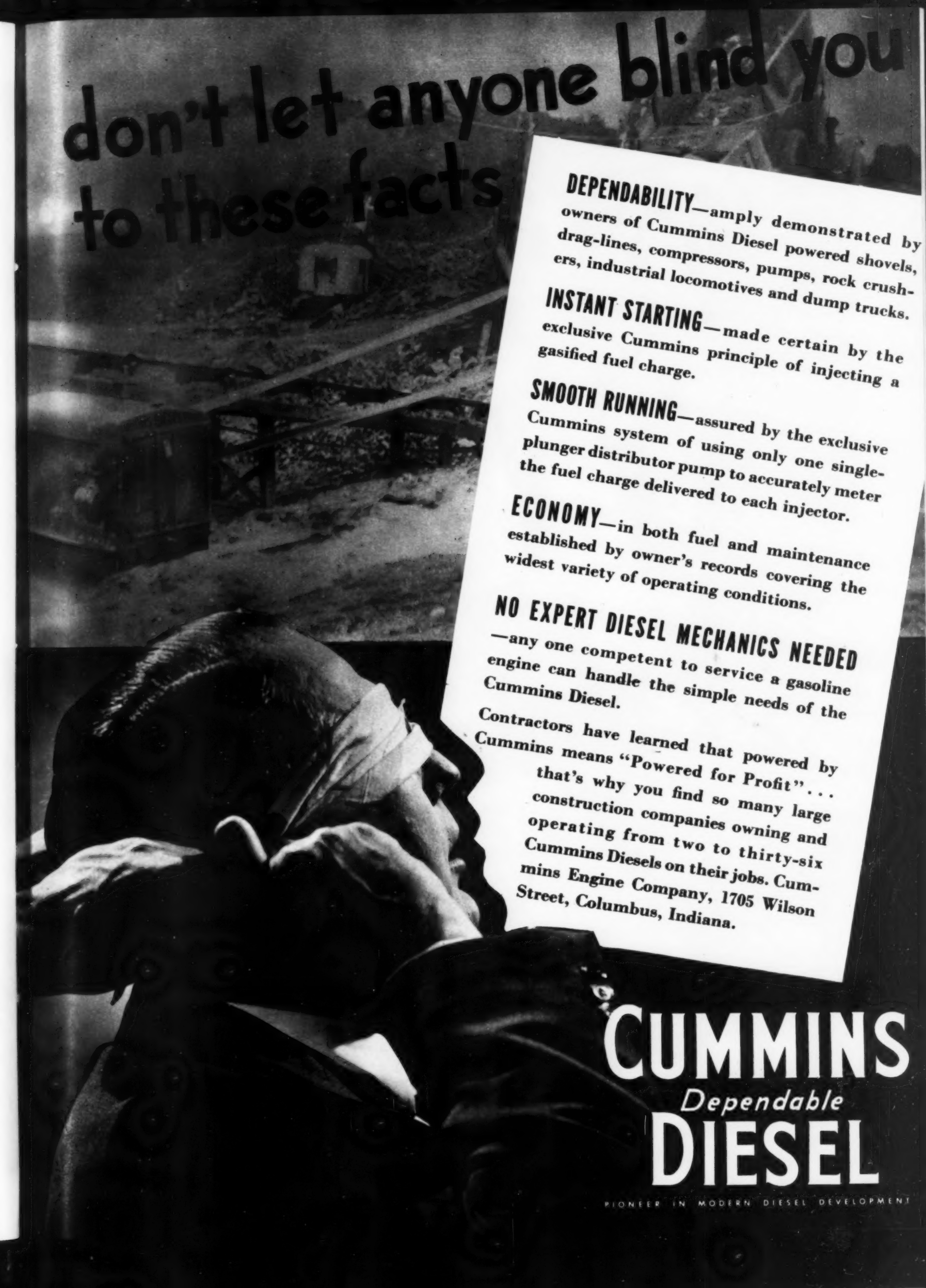
ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES


don't let anyone blind you
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DEPENDABILITY—amply demonstrated by owners of Cummins Diesel powered shovels, drag-lines, compressors, pumps, rock crushers, industrial locomotives and dump trucks.
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Utilizing the same engineering principles and built to the same exacting standards as Marion's larger machines, Marion clutch-type excavators are able to defy the years and roll up imposing service records in any field of operation. Long life, ease of handling, and low operating and maintenance costs make these excavators the outstanding values in today's market. Write for additional reasons why they enjoy such big sales. ● There is a Marion for every material handling job. » » » »

"The Marion we bought two years ago on its first job handled over 500,000 cu. yards of hard, mountainous digging without the slightest difficulty or delay," says Capt. W. W. Boxley, W. W. Boxley Sons & Company, Roanoke, Va.

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Construction Methods and Equipment

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ROBERT K. TOMLIN, Editor

Volume 20 **March, 1938** Number 3

Special Derrick,

Easily Set Up and Moved, Handles Spillway Gate Machinery on Ft. Peck Dam

IN FOLDED POSITION derrick (left), raised by crawler crane, is being seated on concrete pier masonry. Note turnbuckle attachment to collar at top of 40-ft. mast.

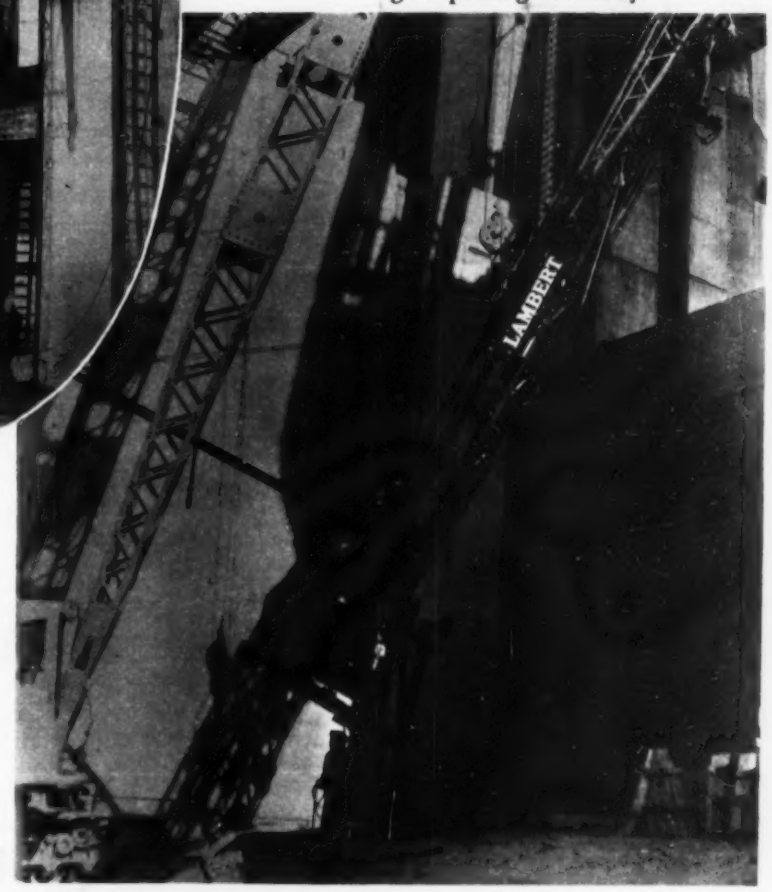
MAST OF DERRICK. latticed-steel column 40 ft. long, is seated on concrete pier of spillway structure and held in place at top by turnbuckles from steel collar and at bottom by jacking against masonry of pier.

DECIDEDLY NOVEL in design is the derrick that has been developed to hoist into place all machinery needed for operating the sixteen 75-ton spillway gates at Fort Peck dam, U. S. Engineer Department project in Montana. Since the highway bridge structure over the spillway had not been completed at the abutment ends when the gate machinery was ready for installation, material could not be delivered by that route, thus necessitating the derrick illustrated herewith. Designed by the McKiernan-Terry Corp., of New York City, for quick set up on the concrete piers of the spillway, the derrick weighs 5 tons and has a lifting capacity of 12 tons at 15-ft. radius. The boom is 34 ft. long and the rear arm support 19 ft.

Electrically operated and mounted upon a latticed-steel mast 40 ft. high, it is provided with a 10-hp. power boom hoist and a 10-hp. power load hoist operating a 7-part line. Swinging of the boom is done by hand power from controls operated by one man from a seat at the foot of the boom. While being raised by a crawler crane into place on the concrete piers of the spillway structure, the derrick is folded up and, after being seated, is opened like an umbrella, ready for service.

The derrick is held in place on the piers without resort to guys or holes drilled in the masonry. At the top, support is provided by tightening turnbuckles on wire rope cables from a collar around the vertical mast of the derrick. Support at the bottom is obtained by extending screw-jacks, contained in the 7 ft. 6 in.x5 ft. 4 in. derrick base, against the concrete piers.

Preparatory to moving the derrick to a new pier location a projecting balancing beam is lowered and a 400-lb. weight attached to its end to keep the derrick vertical while being seated in its new location. The derrick then is folded up into a compact unit, picked up by a crawler crane with long boom and shifted to its new setup. The opening or closing of the derrick, prior to setting it up or moving it to a new location, is accomplished by operation of the boom hoist, no other adjustments or operations being necessary. The derrick has handled more than 1,000,000 lb. of gate-operating machinery.



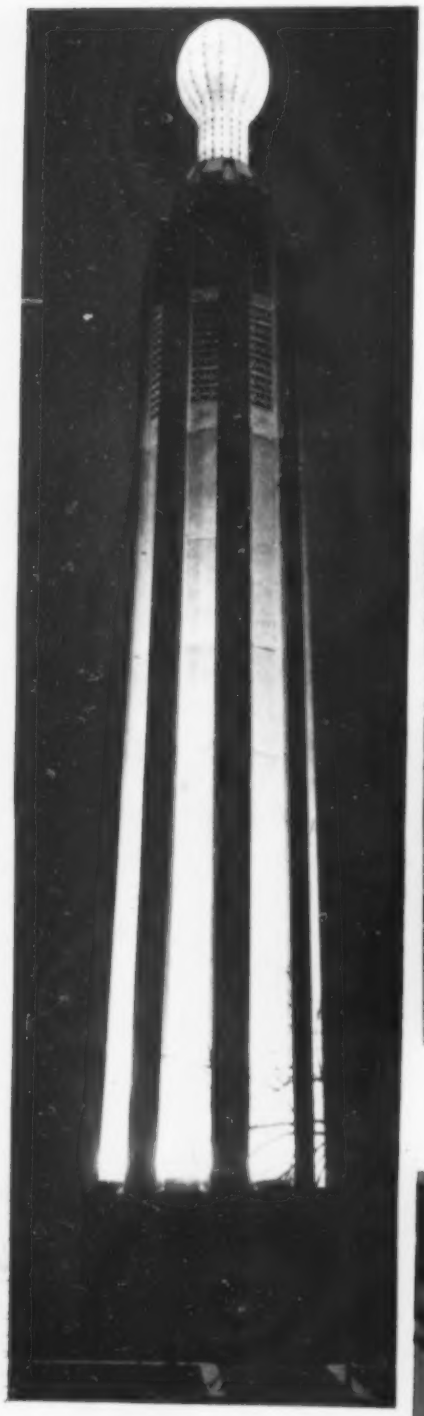
MOVING OF DERRICK. in folded position, to new set-up is easily accomplished by crawler crane.

SECOND DECK (right) is added to increase traffic-carrying capacity of Henry Hudson bridge across Harlem River, New York City, part of West Side Improvement directed by Robert Moses, commissioner Department of Parks. Each level of the bridge will carry one-way traffic. Bridge has 800-ft. fixed arch span of two double girder silicon steel arch ribs 12½ ft. deep and 50 ft. apart, flanked by 300-ft. continuous steel girder viaducts. Bridge superstructure was erected by American Bridge Co.

Wide World Photo

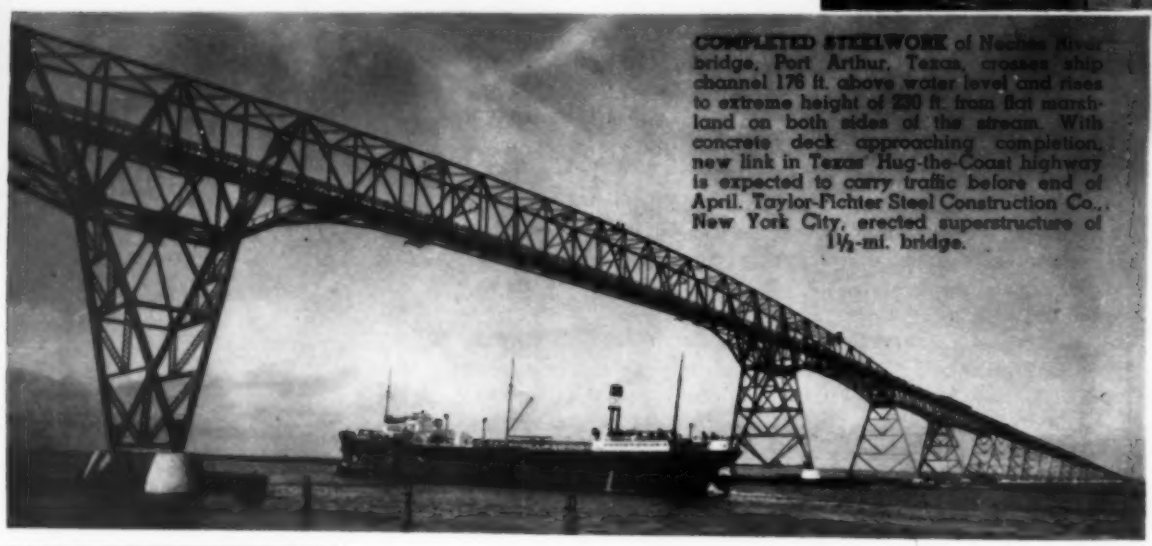
SKATING QUEEN (below) presents $300 award for highway poster contest. From Sonja Henie 17-year old Clarence Van Duzer receives art scholarship sponsored by American Road Builders' Association during recent annual convention and Road Show at Cleveland, while Col. Willard Chevalier (left) association president and Charles M. Upham (right) engineer-director, look on.

This Month's "NEWS REEL"



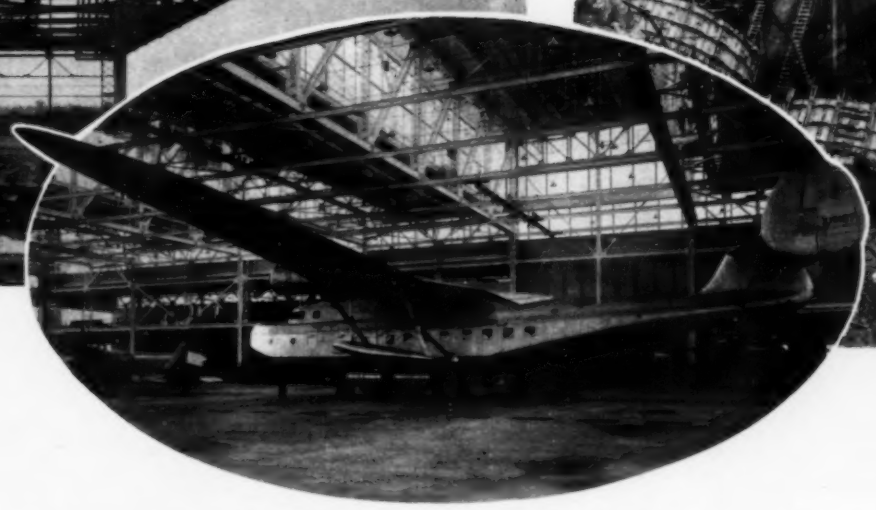
EDISON TOWER, 130-ft. memorial shaft of steel and concrete at Menlo Park, N. J., is dedicated Feb. 11 when 14-ft. bulb of Pyrex glass is illuminated for first time. Structure costing $100,000 was built by Walter Kidde Constructors, Inc., of New York.

PREFABRICATED HOUSE of frameless construction, using plywood panels, to cost from $2,000 to $3,000, has been developed by Forest Products Laboratory of U. S. Forest Service. Wall panels of 4 ft. width are 3 in. thick, packed with insulating material.



COMPLETED STEELWORK of Neches River bridge, Port Arthur, Texas, crosses ship channel 176 ft. above water level and rises to extreme height of 230 ft. from flat marshland on both sides of the stream. With concrete deck approaching completion, new link in Texas Hug-the-Coast highway is expected to carry traffic before end of April. Taylor-Fichter Steel Construction Co., New York City, erected superstructure of 1½-mi. bridge.

WORLD'S FAIR BUILDINGS take form on 1,216-acre site in Flushing Meadow Park, New York City, well ahead of scheduled date of opening of exposition in 1939. Structures shown in aerial photo are: (1) Administration Building; (2) Hall of Communications; (3) Textile Building; (4) Hall of Shelter; (5) Food Building; (6) Hall of Medicine and Public Health; (7) Consumer Interests Building; (8) Hall of Mines and Metallurgy; (9) Food Building; (10) Hall of Business Administration; (11) New York City's "Glass House"; (12) Theme Center, to include Perisphere and Trylon.



UNOBSTRUCTED FLOOR SPACE. (in oval and above) 300x450 ft., is provided in new $2,000,000 airplane assembly plant for Glenn L. Martin Co., Baltimore, Md., designed and built by Albert Kahn, Inc., architects and engineers, of Detroit, Mich. Roof trusses of 300-ft. span, 30-ft. deep and weighing 123 tons, required bridge-building methods for erection. End columns are 4 ft. deep, of open lattice type. On 135,000 sq. ft. of floor space, with no interior column, planes of 165-ft. wing spread and 94-ft. length are assembled.

BARTLETT DAM on Verde River, 54 mi. northeast of Phoenix Ariz., takes form as world's highest multiple-arch structure. Concrete, steel-lined arches and buttresses alternate between abutments of 270-ft. high structure with crest length of 750 ft., being built for U. S. Bureau of Reclamation by Barrett & Hilp-Macco Construction Co. to store water for irrigation on Salt River project.

House-Building Headaches Relieved by

PRE-PLANNING

Photos by Alexander Houses, Incorporated

TO ELIMINATE conflicts and lost motions commonly encountered in house construction by independent collaborating agencies — owner, architect, general contractor and subcontractors — a young Connecticut concern, Alexander Houses, Inc., has created an organization which combines the functions of design and production under unified control and single responsibility. The organization is equipped to design and deliver a complete, custom-built house on order at a predetermined, fixed price, with avoidance of unforeseen additional costs and annoyances. This result is made possible by complete pre-planning on the part of the firm's engineering department, which prepares detailed structural and mechanical plans to fit the conception of the architectural department before a single stick of wood is bought. Following his pre-planning work, the firm's engineer backs up the constant supervision of the job superintendent by periodic inspection of the house during construction.

In its essence, the organization's procedure is designed to give to house building the same sort of engineering service and construction efficiency which goes into large projects. Detailed structural and mechanical plans, ordinarily omitted by architectural designers, form the basis of the integrated construction procedure. By providing accurate diagrams of heating, plumbing, duct work and framing, the designer makes it unnecessary for carpenters, plumbers and heating mechanics to figure out the structure as their work progresses. Conflicts are eliminated in the design stage instead of being encountered on the job, where they result in poor compromises. Both labor efficiency and construction quality benefit from this foresight.

Cost of professional engineering services can be carried by a continuing organization which includes an engineer as a regular member of its staff and distributes the engineering overhead over a number of projects. Under ordinary methods of construction, engineering service cannot be afforded on houses below the $50,000 — $75,000 class.

Impartial planning and purchasing by competent architects and engineers, completely detached from any commercial interest, permit unfettered creation of a finished house meeting the owner's desires at the lowest cost consistent with sound construction.

House Construction — For its first house, erected as a demonstration of coordinated design and building methods, the firm elected to follow the early Connecticut style, with modern improvements such as oil-fired conditioned-air heating, insulated walls, and elimination of the cellar. Wood-frame exterior walls and partitions of the house bear on concrete footings, while the interior ground floor floats on an independent reinforced-concrete slab.

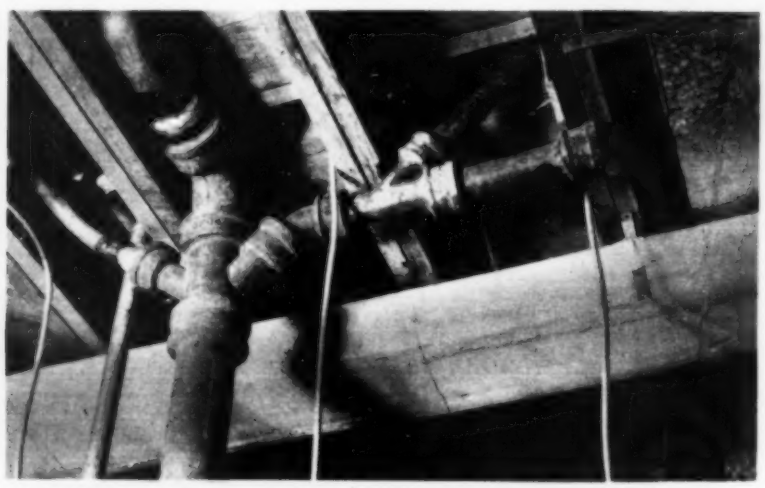
Careful analysis of common mistakes in house construction guided the organization in avoiding similar errors in the demonstration house. Evidence of ordinary mistakes in houses of the better class is presented in accompanying photographs. Contrasted with them are photographs showing sound construction practices in the demonstration house.

After preliminary architectural sketches have been made, good practice demands that complete plumbing and heating diagrams be available before the frame is designed, in order that the pipes and ducts may be fitted between studs and joists without danger of conflicts which would require cutting of timber during installation. Design of foundation, framing, wall covering and chimney, to mention only major elements, likewise requires the attention of a professional engineer to make sure that these component parts, separately and as a unit, meet specified standards for rigidity, future settlement, and resistance to wind and weather.

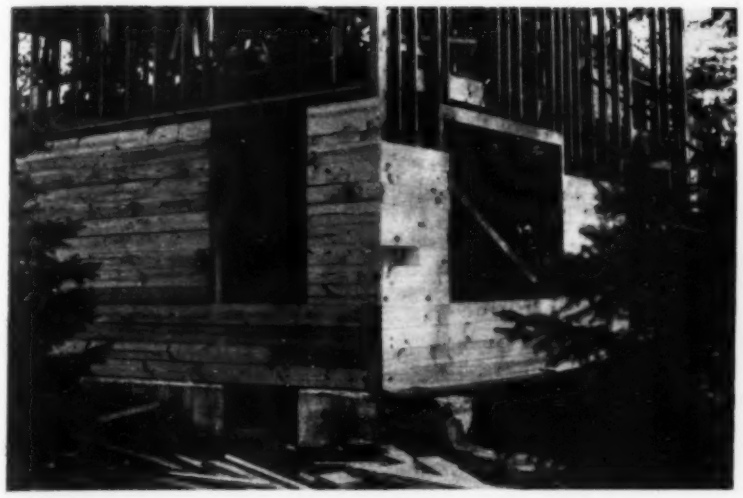
Cost of sound construction carried out in accordance with the principles outlined in these notes proved slightly higher than for less carefully controlled construction under the ordinary system of divided responsibility. The finished house, on the other hand, is sufficiently superior to attract buyers and prospective clients, and the builders have found emphasis on important details, as illustrated in the photographs on the following pages, to be a great aid to current sales and future business.

Personnel—Executive personnel of Alexander Houses, Inc., comprises Malcolm S. McGhie, president, New Canaan, Conn.; Will Rice Amon, architect, New York City; and Walter H. Martin, mechanical engineer, New York City. All of these men are members of the firm. The demonstration house was erected in New Canaan, Conn.

BAD ... **LACK OF ENGINEERING PLANNING** causes conflict between plumbing pipes and joists under bathroom floor, resulting in fatal wood butchering by plumber. Tile floor laid on top of these joists almost inevitably will sag and crack under concentrated loading of heavy bathroom fixtures. Slope of pipe requires deeper cuts in successive joists on way to stack.



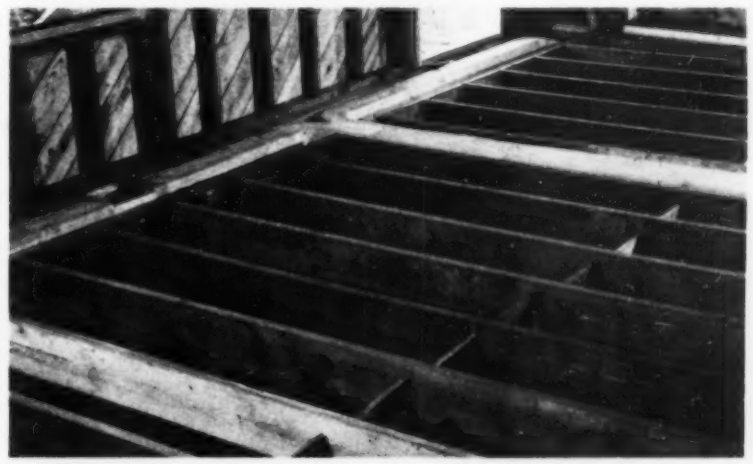
GOOD ... **COMPLETE PRE-PLANNING** fits plumbing and framing together without conflict. Compact design utilizes single stack to serve two bathrooms. Floor joists are doubled and made shallower to permit laying full wood floor without cutting "cats" between joists to support cement slab for bathroom. Double joists will carry heavy fixtures without sagging.



BAD ... **TWO COMMON DEFECTS** in construction, made in this instance on house costing $25,000. Horizontal sheathing imparts insufficient rigidity and invites later vibration and plaster cracking when strong winds blow. Second fault is non-uniform wall framing, with studs of wall at right running to full two-story height, while studs of wall at left are broken by 4-in. plate at second floor level. Because wood shrinks across grain and not in direction of grain, house frame should have same thickness of cross-grained lumber on all sides.

GOOD ... **DIAGONAL SHEATHING,** securely nailed to studs, lies at 45 deg. angle (in direction of stress) and greatly stiffens structure. Waterproof fabric (indicated by arrow in lower right corner) extends from interior independent slab across footing wall under wooden sill to keep framing dry and to deter termites from entering framing. Loose edge of fabric later will be folded up over sheathing and nailed.

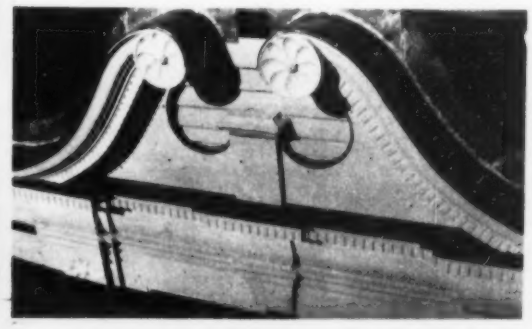
BAD ... **GROSS BLUNDERS** result from lack of advance planning. In this case basement girder had to be offset from column to allow duct to pass under stair landing, giving promise that floor will sag, joints in trim will open up, doors will bind and ugly plaster cracks will appear. Floor joists of this house rest directly on foundation walls at extreme right, on about 10 in. of cross-grained timber at intervening girder, and on 20 in. of cross-grained timber above pipe column in foreground. Apart from weak framing under stairway, this variation in thickness of cross-grained timber will cause unequal settlement of various portions of floor.



GOOD ... **PERFECT FIT** of conditioned-air heating ducts into floor framing is result of complete engineering plan. Ducts have long straight runs and sweeping turns for easy air flow, and supply duct openings are placed near floor in exterior walls where they can function most effectively in maintaining uniform warmth inside rooms. This location of floor duct openings is preferable when there is no intention of adding summer cooling at later time. Ground-floor joists rest on reinforced-concrete foundation slab placed on gravel fill, with asphalt-impregnated fabric between concrete and joists. Notches in bottoms of floor joists provide for free air circulation through 8-in. space under wooden sub-flooring. For extra protection, warm air circulation is induced in this space from holes in air ducts.

BAD ... **BUTTING JOISTS** end to end saves lumber but reduces bearing area of each joist by half and greatly decrease rigidity of floor. For greater strength, joists should be spliced and securely spiked.

GOOD ... **SPLICED FLOOR JOISTS** extended some distance beyond partition plate and securely spiked together furnish continuous-beam action in these floor members under diagonal sub-flooring, greatly reducing sag in floor between supports.



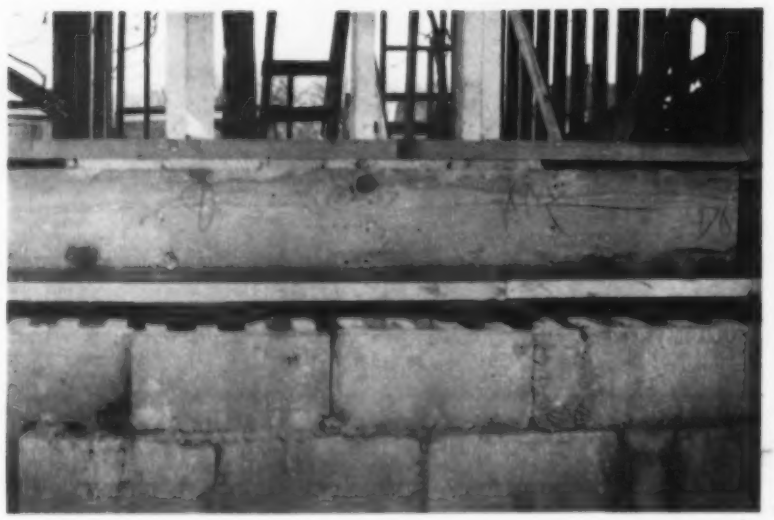
GOOD PRACTICE ... Careful Copper Flashing of all vertical joints and water-shedding surfaces of front-door pediment makes this piece of millwork practically leakproof and warp-proof. Careful attention to flashing eliminates one of commonest nuisances in houses.

Pre-Planning vs. Poor Planning

(Continued)

BAD ... **WEAK ROOF (left)** results from sloppy cutting of rafters. Nails alone must take all stresses produced by natural shrinkage and settlement. Inadequate tools may have handicapped carpenters on house.

GOOD ... **CLEAN, TRUE CUTS** by power saws permit accurate framing of rafters to ridge pole, providing solid bearing of wood to wood. For shingle roof, good design dictates heavier rafters and 1x2-in. roofing nailers, which admit more air than 1x4-in. nailers to underside of shingles and thus help to dry them out quickly after rain and save them from rot.

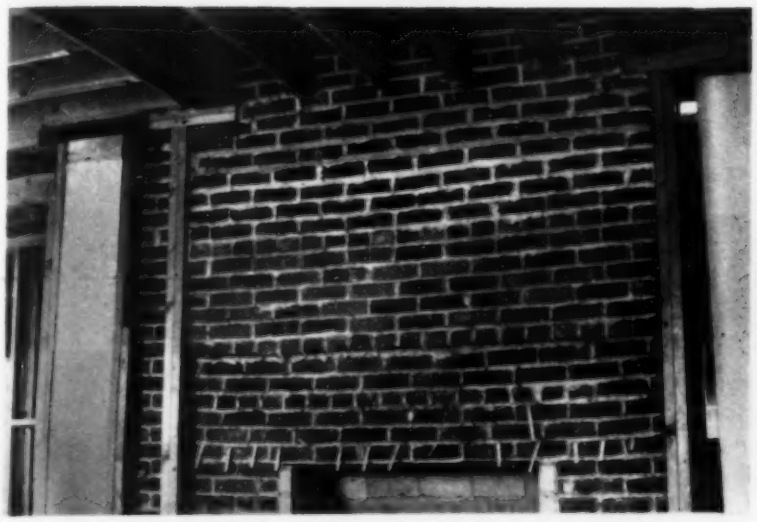


BAD ... **SLATE CHIPS (left)** support sill of house frame which had to be leveled up on poorly laid foundation wall. Open spaces under sill presumably will be filled with sand-cement mortar, but holes in blocks will make this filling unsatisfactory as uniform, wind-proof bearing for wooden framing.

GOOD ... **CAREFULLY LEVELED FOUNDATION WALL** furnishes solid bearing for timber sill throughout its length and closes all openings against wind. Vertical holes in blocks of foundation wall are filled with concrete before sill is laid.

BAD ... **BUILDING PAPER** is intended to furnish seal against moisture and wind. On this house, paper is being applied piecemeal with insufficient, extremely narrow overlap around window frames. Although horizontal sheathing sometimes is considered permissible in stone- and brick-veneered houses, diagonal sheathing is better.

GOOD ... **LONG UNBROKEN STRIP** of high-grade building paper is applied across front of properly constructed house, providing solid wind break. Note generous overlap of protective paper around window and door frames. Millwork and siding have been primed on all sides with white lead and oil before erection. Asphalt-impregnated fabric extending across foundation wall under wooden sill has been turned up and nailed to diagonal sheathing.

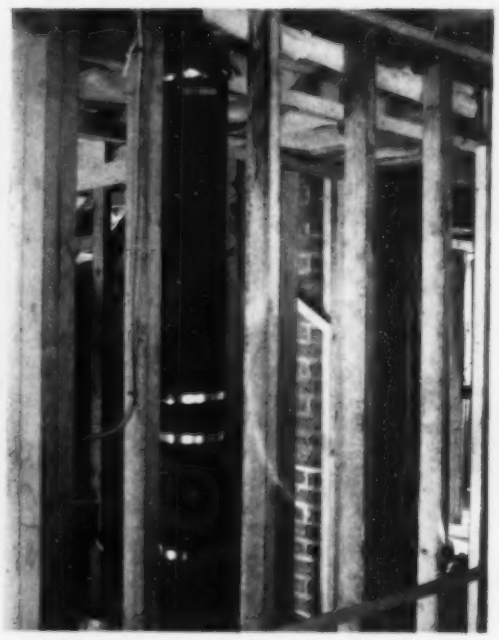


BAD . . . **IN VIOLATION** of good building practice as well as most fire laws, designer of this $20,000 house permitted floor joists to be bedded in chimney. Aside from danger of fire, good practice requires that timber framing be kept separate from brickwork to prevent unequal settlement.

GOOD . . . **CHIMNEY STANDS FREE** of house framing **(right)**, avoiding dangers of both fire and unequal settlement. Concentrated load of chimney, resting on separate footing, will settle faster than rest of house, and timber frame will shrink at different rate from masonry. Because only contact between chimney and house structure is through copper flashing at roof, these differences in settlement and shrinkage will cause no distortion of framing.

BAD . . . **EASIER AND CHEAPER** but extremely harmful to structure is method employed by plumber in this case, where roof rafter is cut away to make way for plumbing stack. Roof may sag and leaks occur at flashing around this pipe.

GOOD . . . **TWO 45-DEG. BENDS** carry plumbing stack past rafter without any cutting or damage to structure. Roof retains rigidity—will not sag around stack.



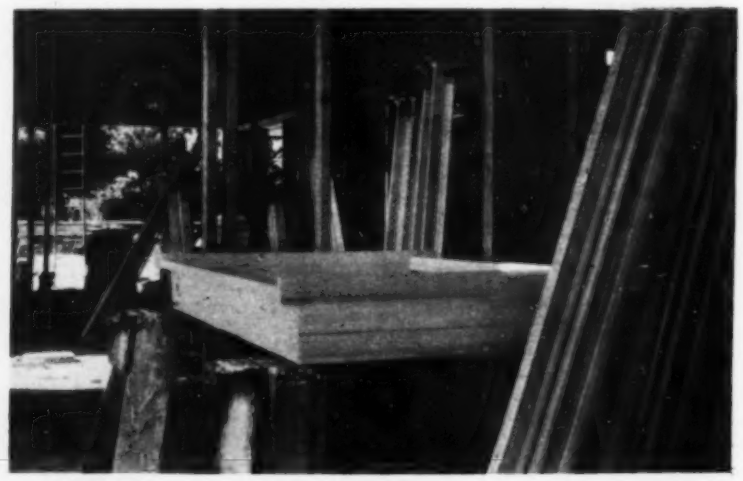
SILENCER . . . To Deaden Sound of flushed water through plumbing stack in dining room wall, builders wrap pipe with heavy hair felt and cover this wrapping with tarred building felt. Hair felt may be seen at top, where tarred felt has not yet been applied.

BAD . . . **SOIL AND WASTE PIPES (left)** running under basement floor (not yet concreted) to sewer 30 ft. away can be cleaned out when necessary later only at great expense to owner because clean-out plugs have been omitted at bends. Plumber will have to break joints, instead of unscrewing clean-out plugs, before forcing wire through pipes.

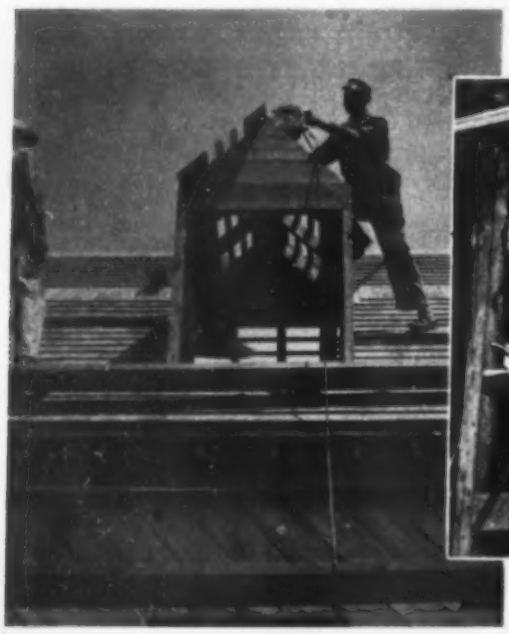
GOOD . . . **CLEAN-OUT PLUGS (right)** at ends of straight runs in plumbing pipes make it easy later to remove stoppages by running wire through pipe. Because it is difficult or impossible to force wire around bend, every bend should have clean-out.

Pre-Planning vs. Poor Planning *(Continued)*

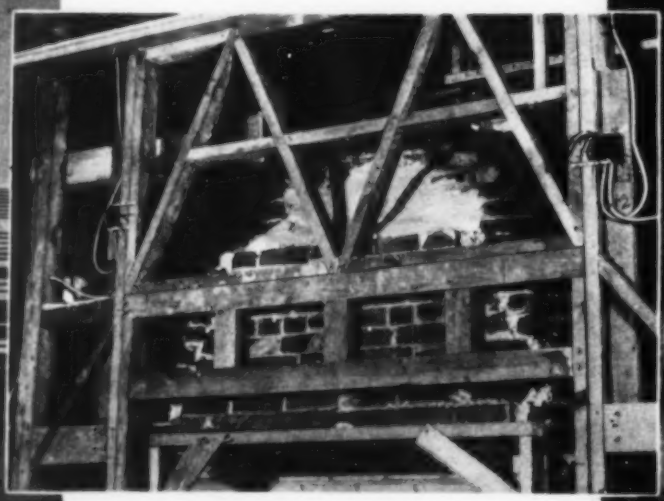
BAD ...**EXPOSED TO WEATHER,** unprimed window frames and other expensive woodwork suffer alternate soakings and dryings which start shrinkage and warping, leading to almost certain trouble after units are erected in house.



GOOD ...**STORED AND PRIMED** under cover, millwork of properly constructed house is protected by coat of white lead and oil before being nailed up in weather. Without this protection, one good wetting will start warping of millwork.

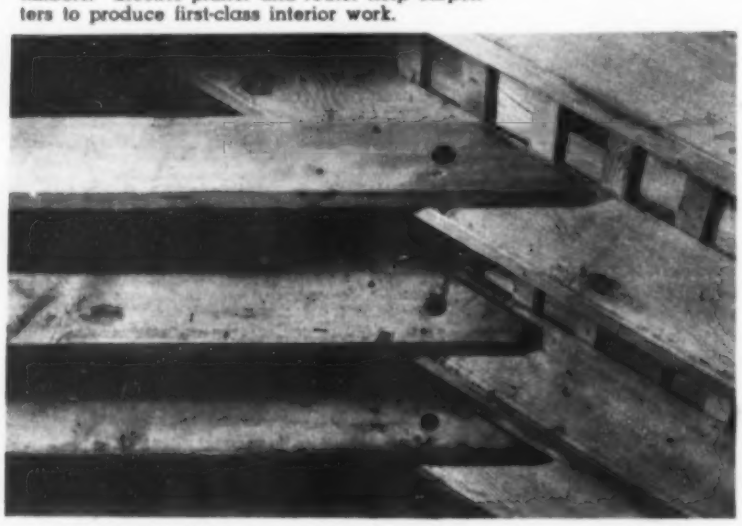


BETTER TOOLS . . . Power Saw aids accurate cutting and completes tedious jobs easily leaving carpenters fresh for better general work. In addition to hand power saw, builders use stationary power saw to cut rafters and large timbers. Electric planer and router help carpenters to produce first-class interior work.

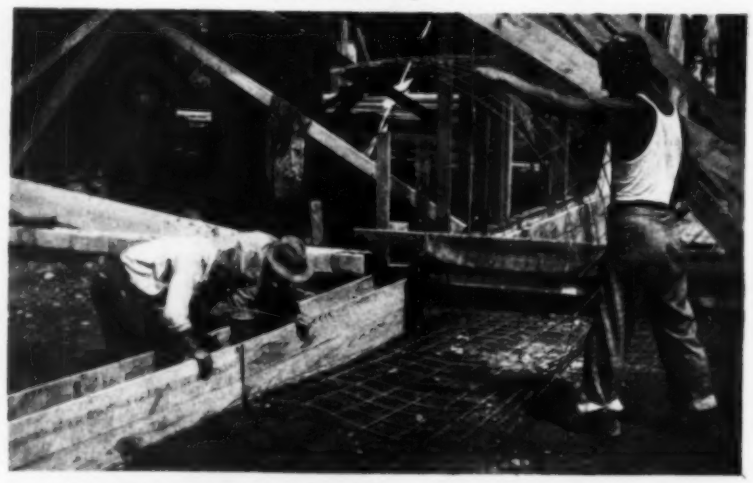


FIREPLACE FRAMING . . . Timber Truss carries floor load across wide opening above fireplace. Advanced design avoids two common evils: framing into chimney and using deep beams. Latter practice causes excessive shrinkage and sagging floor in vicinity of chimney.

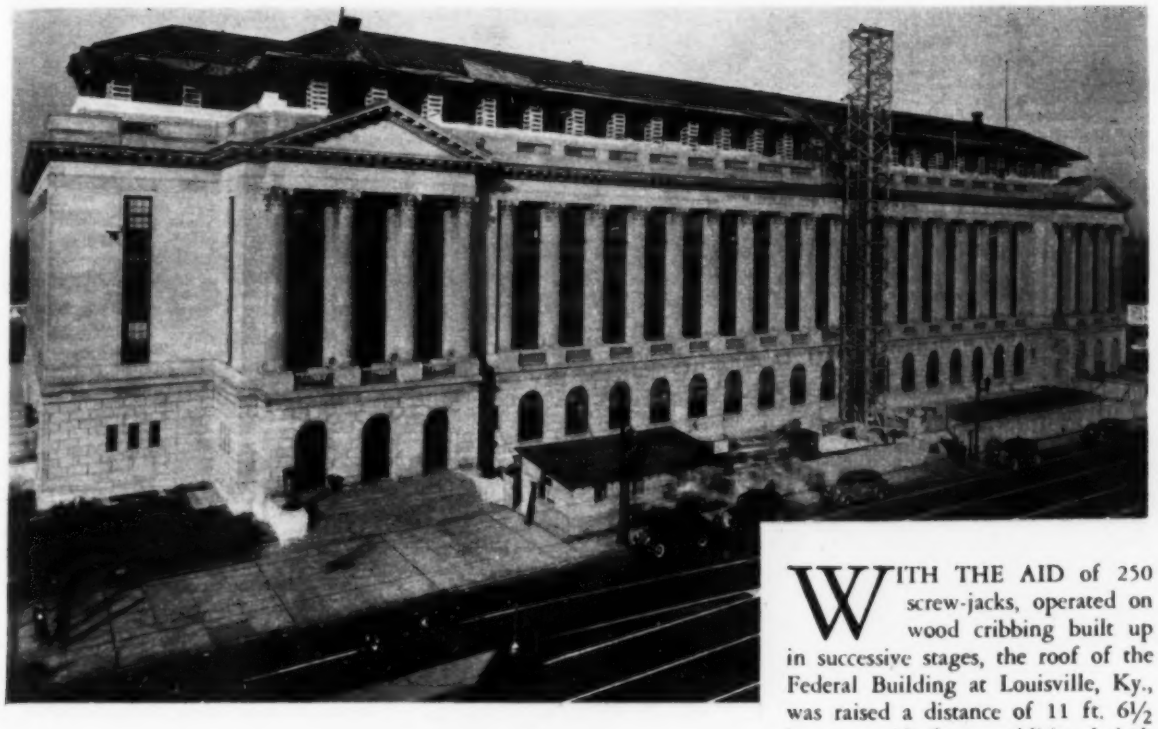
PROTECTED INSULATION . . . Waterproof Paper covers rock wool insulation in house walls to prevent insulation from absorbing evaporated moisture from plaster as well as condensation resulting from infiltration of warm air into wall spaces. It is important that walls be even tighter on inside than on outside to prevent warm air from getting into space between studs and causing condensation in rock wool, reducing insulating value of this material and rotting wood sheathing.



ADDED STRENGTH . . . Bolted Cross-Braces between roof rafters prevent these members from spreading, pushing walls apart and letting roof sag. Ridge roof takes heavy wind thrust which ordinary construction with nails cannot resist properly. Resulting distortion of roof framing frequently produces house ailments far removed from source in attic.



FOR HOUSE WITHOUT CELLAR . . . Foundation Slab laid on gravel fill under house is reinforced with welded wire mesh carried under plumbing trench to make slab continuous.



RAISED ROOF (left) of Federal building is supported by built-up timber cribbing at height of 11 ft. 6½ in. above its original position.

New Story Added to Louisville Post Office by RAISING ROOF *With 250 Screw-Jacks*

WITH THE AID of 250 screw-jacks, operated on wood cribbing built up in successive stages, the roof of the Federal Building at Louisville, Ky., was raised a distance of 11 ft. 6½ in. to provide for an additional sixth story on top of the existing 5-story structure housing the local U. S. Post Office. At a bid price of $168,218 the job of remodeling the building was awarded to Algernon Blair, contractor of Montgomery, Ala., for whom W. G. Ireland was superintendent. The roof-jacking operation was handled under subcontract by R. H. Metzcar & Son, of Cincinnati, Ohio, specialists in rigging and shoring.

As illustrated herewith, the building is a monumental structure involving a steel frame and exterior facing of limestone on front and side elevations, with the rear elevation of face brick. The section of roof raised by jacking was 359 ft. long and 78 ft. wide.

The method employed for raising the roof was, in brief, as follows: Steel channels were first fabricated to the existing roof beams and columns and then 12x12-in. timbers were installed to the full length of the building along four different bays. Under these timbers a total of 250 screw-jacks were set, in pairs, on timber cribbing, ready for the raising operation after the roof had been cut away from the walls of the building.

The crew assigned to the roof-raising operation consisted of 23 men and 3 superintendents. Each man would make the rounds of the cribbing supporting the roof, pulling each screw-jack one-quarter turn which caused a rise of ⅛ in. On the average, the roof was raised 18 in. per day. As each lift was completed the timber cribbing was built up to seat the jacks at a higher elevation for the next shove. The total lift accomplished by this method was 11 ft. 6½ in. Actual jacking operations were completed in 8 days and the entire raising job required only 31 days.

After the roof was raised to the required new height, steel for the sixth floor was fabricated to its roof and the jacks and cribbing removed. In handling this job, the contractor reports the use of 30 tons of new steel channel, 7,000 wood cribbing blocks, 20,000 ft. of 12x12-in. timbers and 250 screw-jacks.

SCREW-JACKS totaling 250 in number are supported in pairs by timber cribbing. Note steel channels fabricated to roof structure.

TIMBER CRIBBING (left) is built up as screw-jacks raise roof, 359x78 ft. in area, at rate of 18 in. per day.

Pennsylvania Utilizes Local Materials in State-Wide

Road Stabilization

GRANULAR MATERIAL comes from borrow pit where 1-cu.yd. shovel feeds gravel to hopper of bucket loader equipped with shaker screen.

WETTING SUBGRADE by tank on truck precedes dumping of gravel and binder soil on stabilization project of Holmes Construction Co., near Meadville, Pa. Sprinkler also keeps stabilized soil courses wet during rolling.

SPREADER BOX (left) distributes gravel in 8-ft. strip to proper depth for further widening and leveling by blade machine.

BY ITS CURRENT PROGRAM of stabilized soil road construction, calling for the building of projects using diverse local materials under district office control but with the aid and advice of traveling engineers from the central highway laboratory, Pennsylvania is testing the adaptability of various materials to soil stabilization and, at the same time, is developing standardized, simplified procedures in design, control and construction. The theory and practice of soil road stabilization are being applied through a state-wide program to their entire range of highway uses — from permanent, complete wearing course for farm-to-market roads to stabilized base and shoulders for high-type pavement.

Under the steady drive toward better results, methods of field control and construction, as well as standards of design, have shown continued improvement. On the many small rural projects built by the maintenance division of the district organizations, maintenance superintendents and construction foremen have developed effective methods of building stabilized soil wearing courses. Contractors are learning to bid on soil stabilization jobs with some confidence and to build them with some profit. The Department of Highways still faces the problem of writing an equitable contract for this type of work, which depends for its estimates on preliminary soil surveys that may prove extremely misleading, requiring a contractor after a job has started to develop unexplored and sometimes distant sources of aggregates and binder soil.

Construction Equipment — Soil road stabilization (apart from any grading or drainage work that may

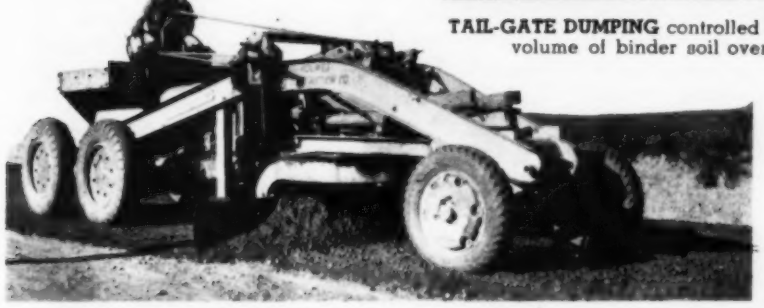
BINDER SOIL is loaded out of borrow pit by ⅜-cu.yd. shovel into trucks hauling uniform loads of 2.44 cu.yd., struck measure.

CALCIUM CHLORIDE is added to soil by lime spreader on state-built stabilization project.

POWER SHOVEL MIXES MATERIALS for stabilized soil shoulders. Pea gravel dumped in proper proportion on surface of borrow pit is added to bank-run material by shovel dipper.

be included in a project) requires adequate construction plant, as will be indicated in descriptions of two jobs that follow. A project may require power shovels for stripping and loading in borrow pits, a fleet of trucks for hauling materials, a tank truck for water distribution, tractors of various power ratings, one or two blade graders, one or two motor patrol graders, spreader boxes and other spreading devices, scarifiers, disk harrows and spring-tooth harrows for breaking up and pulverizing materials on the roadway, a lime spreader for applying chemical admixtures and several power rollers.

TAIL-GATE DUMPING controlled by hand lever distributes accurate volume of binder soil over proper length of roadway.



MOTOR GRADER blades granular material and binder soil to desired width and depth for mixing. Blade machine also levels materials after mixing.

Diverse Materials—Most of Pennsylvania has a non-uniform, conglomerate soil which sometimes possesses binding quality and sometimes does not. Ordinarily an engineer can find binder soil within reasonable distance from a project in any part of the state except the northwest corner, where binder sometimes is difficult to find.

Rock satisfactory for aggregate underlies almost the entire state, and quarries are found in every county. Rock formations range from soft sandstone and shale, in the west to limestone in central and eastern Pennsylvania, where also occur some gneisses, bastard granites, traps and sandstones. Gravel is present in the glacial drift covering many northern counties and the northwest corner of the state and is found elsewhere in the valleys.

Two industrial wastes widely available for road construction are slag and red dog. Crushed water-cooled slag from the many blast furnaces in the state makes an excellent road-building material. Red dog (incinerated waste of bituminous coal mines) has been used to produce satisfactory bases.

Mixture Design — In designing mixtures for a soil road stabilization project, the analyses of aggregates and binder soils are made by the central testing laboratory, but each of the twelve highway districts in the state now has a trained man who designs the mixtures from the data supplied by the laboratory as the result of these tests. For simplicity's sake, the testing laboratory has set up and written specifications for five general designs of mixtures.

Mixing on Road—Except in those cases where a bank-run gravel of proper gradation and plasticity index can be obtained, the combination of aggregates and binder soil has to be achieved by mixing either in a central plant or on the road. In Pennsylvania, the builders of stabilized soil roads have depended almost entirely on road mixing. Two methods are permitted by the specifications.

By the one method, the various materials are successively windrowed on the two sides of the roadway, spread across half widths of the road in layers and bladed back and forth to obtain the proper mixture.

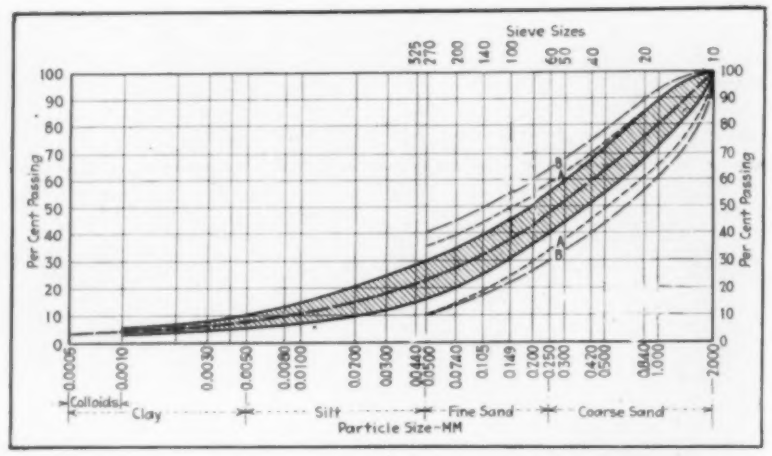
A second method, which has proved equally desirable and effective, permits the use of disk harrows and spring-tooth harrows to work the successive layers of materials into an intimate combination. This method was used by a contractor for stabilized soil road construction on state route 86 between Meadville and Cambridge Springs, in the northwest part of the state.

Contractor's Methods — For the 7½-mi. stabilized soil road on this contract the Holmes Construction Co., Wooster, Ohio, contractor, had to obtain 17,541 cu.yd. of granular material and 3,096 cu.yd. of binder soil from borrow pits outside the limits of the right-of-way. The design called for a stabilized soil road built in two 3-in. layers to a final compacted thickness of 6 in. and to a width of 20 ft., with 5-ft.-wide shoulders tapering from 6 in. to zero. To take care of the feathered shoulders, the contractor spread the bottom course 25 ft. wide and the top course 30 ft. wide. This procedure required 5.5 cu.ft. of stabilized soil per linear foot of bottom course and 6.72 cu.ft. per linear foot of top course, and the contractor dumped the materials in accordance with these proportions, putting 45 per

Typical Gradations of Mixtures and Soil Mortars

Stabilized Soil Road Holmes Construction Co. Contract			Stabilized Soil Shoulders George S. Mellert-Weidner Co. Contract		
Screen or sieve	*Per Cent passing Finished mixture*	*Soil mortar*	*Screen or sieve*	*Per Cent passing Finished mixture*	*Soil mortar*
1-in.	98.8		1-in.	100	
No. 4	67.5		⅜-in.	96.9	
No. 10	50.0	100.0	⅛-in.	84.0	
No. 40	22.5	45.0	No. 4	67.5	
No. 270	16.5	33.0	No. 10	44.8	100.0
			No. 40	20.0	46.0
			No. 270	14.8	33.0

DISK HARROW mixes gravel and clay in each layer of two-course construction and works calcium chloride into upper course.



SOIL MORTAR GRADATIONS for wearing course (A) and base course (B) under Pennsylvania's 1937 specifications are more liberal than grading requirements, indicated by shaded area, for ideal soil mortar of maximum stability and density.

SPRING-TOOTH HARROW (right) follows disk harrow on six to eight trips ordinarily required for mixing 3-in. layer.

cent of the total gravel in the bottom course and 55 per cent in the top course.

Gravel trucks and binder soil trucks carried uniform loads struck off to 2.44 cu.yd. each. The gravel trucks dumped into spreader boxes which placed the material on the roadway to properly adjusted depth in 8-ft. widths. After this spreading, the gravel was further leveled and distributed by blade machines.

Borrow Pits—Grading of a typical mixture for this contract is given in an accompanying tabulation. Gravel came from two locations, one near the south end and the other near the north end of the job. At the second pit, the contractor used a Bucyrus-Erie gas-air 1-yd. shovel to feed material to a Barber-Greene loader equipped with a shaker screen having 1¾-in. square openings which limited the maximum size of aggregate to 2 in. All of the binder soil came from a clay pit located 1 mi. off the road and about 3 mi. north from the south end of the project. A General ⅝-yd. gasoline shovel loaded clay into the trucks and used part of the time between truck loads to break up shale lumps occurring in the clay.

Gravel plant production was about 500 cu.yd. in 12 hr. If a second loading and screening plant had been available, the contractor would have installed one to double this production. Ordinarily the road crew spread about 2 days' gravel production, 1,000 cu.yd., before adding clay and mixing.

Subgrade Preparation—Included in the same contract was more than 70,000 cu.yd. of common excavation for grading. To take care of a spongy silt subgrade, the quantity of underdrains in the contract was increased from 10,000 lin.ft. to 20,000 lin.ft. Preliminary grading for the roadway was completed by a Caterpillar 60-hp. tractor drawing a Caterpillar 12-ft. blade grader. The tractor was equipped with a bulldozer which was used in trimming high spots. A Galion 10-ton three-wheel roller compacted the rough subgrade. Following this preliminary work, the contractor finished the fine grading with a Galion power grader carrying a 10-ft. blade operated by hydraulic controls. Final subgrade was compacted by a Galion 10-ton roller, likewise equipped with hydraulic controls.

Mixing With Harrows—After wetting the subgrade with a water tank carried on a truck, the contractor spread the gravel for the first layer and tail-gated the proper amount of clay. A blade grader distributed the clay uniformly over the gravel. The two materials were thoroughly mixed by a disk harrow followed by a spring-tooth harrow, each drawn by a wheel tractor, until the mixture was uniform in color. Ordinarily this result required six to eight trips with the harrows. The lower course then was shaped by dragging with an Adams steel road drag and by blading with an Adams motor patrol grader carrying a 10-ft. blade. Finally, the lower course was compacted by longitudinal lap rolling with the Galion three-wheel 10-ton roller. The sprinkler truck kept the surface of the first course wet during the rolling.

In the second course, calcium chloride at the rate of 1 lb. per square yard was added to the mixture after the gravel and clay had attained a uniform color through thorough mixing by the harrows. A lime spreader applied the calcium chloride, which was then worked in

GUIDE-WHEEL ATTACHMENT aids operator of blade maintainer in trenching subgrade for stabilized shoulder alongside concrete slab.

STABILIZED SOIL MIXTURE (right) for each course of shoulder construction is distributed by spreader box.

STABILIZED SHOULDERS under construction along edges of concrete pavement are expected to improve safety and decrease maintenance.

SURFACE TEXTURE of stabilization project originally built with limestone screenings and binder soil, with 2¾- to ⅜-in. limestone worked into road during following spring.

with the disk and spring-tooth harrows. Satisfactory blending of the calcium chloride usually took two trips. The top course was rolled an average of three passes with the 10-ton three-wheel unit, the surface being sprinkled during the rolling. In general, it was necessary to make one pass of backrolling within a day or two.

A mixing crew comprising a foreman and six workmen could average 3,500 lin.ft. of one-course construction to full roadway width in 12 hr. of good weather. On Sept. 18, this crew in 12 hr. placed 4,000 lin.ft. of 3-in. top course, including placing the clay, mixing the clay and gravel, applying calcium chloride, final mixing, and rolling. Some sprinkling and rolling on the 4,000-ft. section had to be done on the following day.

Mixing With Power Shovel—For stabilized soil shoulders of a 5-mi. concrete paving project on state route 179, running east from the Ohio state line in the northwest corner of Pennsylvania, the George S. Mellert-Weidner Co., Medina, Ohio, contractor, utilized run-of-bank gravel, with a natural binder having a plasticity index between 9 and 10, and to this bank material added 33 per cent of pea gravel to give the mixture the proper gradation. Washed and screened pea gravel was hauled about 4 mi. from a commercial plant and was dumped in stockpiles on the ground at the borrow pit where the contractor dug the bank-run gravel. In the process of digging into the bank, a Koehring ¾-yd. gasoline shovel in the pit mixed the pea gravel with the natural gravel.

Shoulders were 8 ft. wide in cuts and 10 ft. wide on fills. They were built to 9-in. depth at the edge of the pavement, in three 3-in. layers, each layer being carried out at uniform thickness from the edge of the pavement to meet the shoulder slope of 1½ in. per foot.

Subgrade operations preparatory to shoulder construction made use of a Galion motor patrol grader with a 10-ft. blade operated by hydraulic controls, one Hadfield-Penfield crawler-mounted maintainer equipped with manual controls, and two Galion rollers, a 10-ton and a 3½ ton.

Subgrade was wetted in advance of the first layer of material by hand-held hose from a truck-drawn tank trailer. Two Burch stone spreaders deposited the stabilized mixture in successive courses of the shoulders. Each course was rolled by a 6-ton Galion roller.

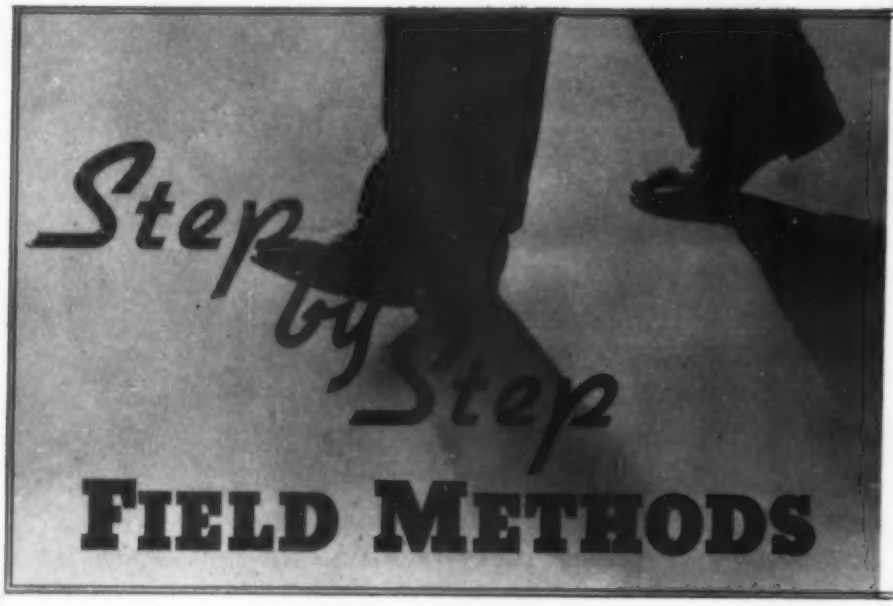
A crew of 12 to 14 men working on the shoulders (exclusive of truck drivers and machine operators) was able in a 12-hr. day to place and roll the first and second courses of one shoulder along 4,000 ft. of pavement. This amount of construction required 400+ cu.yd. of compacted material. The stabilized mixture came out of the pit moist and ready for rolling. Placing of the top course and completion of the shoulder required about as much time as placing the two lower courses.

A typical gradation of the stabilized mixture for the shoulders is indicated by an accompanying table. No chemical was added to the mixture. The compacted material formed hard, dense and durable shoulders, apparently capable of supporting trucks in any kind of weather.

RED DOG ROAD, constructed of material possessing proper gradation but no plastic binder, carries heavy detour traffic of about 2,500 vehicles per day for 6 months without failure.

RESISTANCE TO EROSION (left) is indicated by stabilized soil road of 6-in. compacted depth built of well graded bank-run gravel on silty earth foundation subject to bad washing, as shown by condition of ditch at left.

Administration — Warren Van Dyke, secretary of highways, is a member of the Governor's cabinet and is directly responsible for formulating highway policy. In the State Department of Higways, Samuel W. Marshall is chief engineer, and H. S. Mattimore is engineer of tests, in charge of the testing laboratory. G. A. Rahn, research engineer, directs experimental and testing work on soil stabilization projects throughout the state.

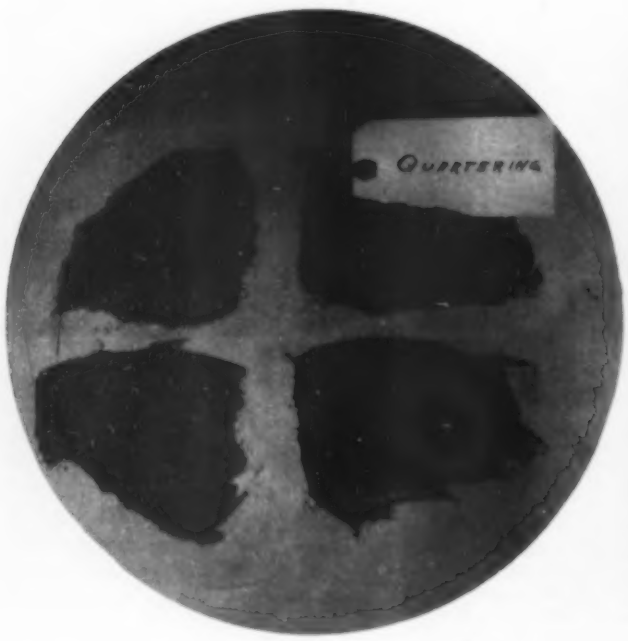


Hydrometer Test of Soil Mortar Gradation

1 **SAMPLE** of stabilized mixture, selected as it exists in field, is quartered down to amount of about 4 lb. needed. Inspector spreads sample in thin layer to dry it quickly.

2 **AFTER DRYING SAMPLE,** inspector screens it through No. 10 sieve, using fingers to break down soil lumps and soil adhering to stones, in order to be sure that important sieving job is thoroughly done.

TO SAVE TIME and labor expended in making gradation tests of soil mortar by conventional sieve analysis, which requires washing of the sample through the 270-mesh sieve, the testing laboratory of the Pennsylvania Department of Highways has devised and made simple hydrometers which give direct readings of percentages passing the 270-mesh sieve, when the instruments are used in accordance with the illustrated procedure furnished by the laboratory with directions to field engineers and inspectors. Experience has shown it to be almost invariably true that if the percentage passing the 270 mesh sieve is in accordance with specifications, the remainder of the sample likewise will meet the requirements for fractions passing the 10-mesh and 40-mesh sieves. Ten photographs are supplied by the labo-



3 **FRACTION PASSING NO. 10 SIEVE** is quartered as required to give amount of about ⅓ lb. needed for hydrometer test.

4 **USING APPARATUS** furnished by highway department testing laboratory, inspector places pan on scale, making sure that pointer stops at upper mark P (pan), scratched on black field. Quartered material passing No. 10 sieve then is added to pan until pointer reaches lower mark P+S (pan plus soil), scratched on black field.

ratory in the instruction book. An accompanying table gives the gradation requirements for the two types of soil mortar admitted for use in soil road stabilization mixtures by the specifications of the Pennsylvania Department of Highways.

Captions printed with the accompanying photographs are taken almost verbatim from the instruction sheet furnished by the testing laboratory. Only one part of the hydrometer correction chart, sufficient to trace the example chosen for illustration, is reproduced with these notes.

In a separate bulletin, the testing laboratory directs the field personnel to make an hydrometer test on material from a composite sample representing each 1,000 lin.ft. of mixed material, or for each change of soil formation, if the change occurs in less than 1,000 ft. In the case of plant mixing, at least two hydrometer tests are to be made for each day's production. The directions specify that for each hydrometer test at least three hydrometer readings shall be made.

Gradation Requirements *Pennsylvania Soil Mortars A and B*		
Sieve	*Per cent passing* A	B
No. 10	100	100
No. 40	45-70	40-75
No. 270	10-35	10-40

5

TO ACCURATELY WEIGHED SAMPLE in pan **(right)**, inspector adds enough water to cover material and allows it to soak for about 15 min.

6

AFTER SOAKING, contents of weighing pan are transferred to stirring bowl, which then is filled with water to 3-cup mark. Inspector adjusts stirrer in bowl and stirs sample thoroughly for at least 2 min. Stirring of sample cannot be overdone.

8

CLOSING OPEN END (left) with one hand, inspector rotates cylinder through 180 deg. for 1 min.

7

FROM STIRRING BOWL inspector pours sample into cylinder, rinsing bowl with additional water and finally bringing level of liquid in cylinder up to mark scribed by testing laboratory.

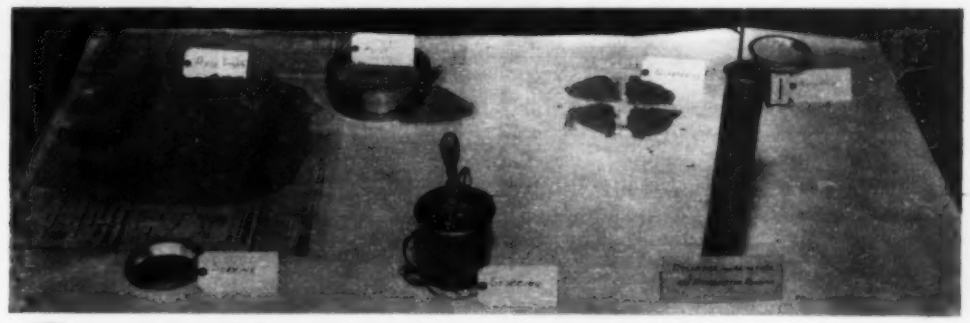
9

AT END OF AGITATION PERIOD, inspector quickly places cylinder on level surface and notes time. At expiration of 1½ min., he carefully lowers hydrometer into center of solution, and at end of 2 min. from time cylinder is set in upright position he takes hydrometer reading and makes a note of it. Finally, he removes hydrometer, dries it and takes temperature reading of solution in cylinder.

Hydrometer Correction Chart

Temp. of mixture, deg. F.	*Per Cent Soil Present Passing No. 270 Sieve* 26	27	28	29	30	31	32	33	34	35
	Hydrometer Reading									
65-72	26	27	28	29	30	31	32	33	34	35
72-77	25	26	27	28	29	30	31	32	33	34
77-82	24	25	26	27	28	29	30	31	32	33
82-85	23	24	25	26	27	28	29	30	31	32
85-88	22	23	24	25	26	27	28	29	30	31
88-90	21	22	23	24	25	26	27	28	29	30

NOTE: Assuming hydrometer reading to be 29 and temperature reading 83 deg. F., inspector would refer to hydrometer correction chart to learn actual percentage of soil mortar passing No. 270 sieve. In this case, correct figure would be 32 per cent, after applying correction for temperature.



10 **COMPOSITE EXHIBIT** indicates all steps and apparatus involved in making hydrometer test.

Job Service Crew

Cuts Time Losses and Reports Operating Costs

By F. T. GUINEY
Master Mechanic
B. Perini & Sons, Inc., Framingham, Mass.

CAPABLE MAINTENANCE CREW aids F. T. GUINEY (left), author of accompanying notes, in keeping equipment in first-class condition on $1,500,000 grading, paving and bridge building project.

FIELD GARAGE. housing stock room and work shop, is erected on graded area providing parking space where equipment can be readily overhauled during periods of reduced activity on job.

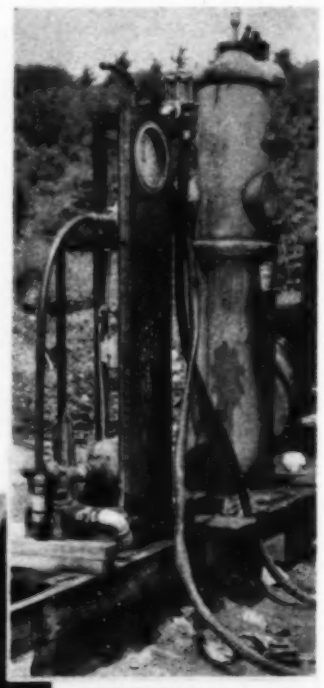
EXPERIENCE on a number of large grading and paving jobs guided B. Perini & Sons, Inc., in organizing equipment maintenance and cost-keeping on the Newburyport Turnpike contracts, executed in 1937 under the supervision of the Massachusetts Department of Public Works, as described in CONSTRUCTION *Methods and Equipment,* Jan. 1938, pp. 56-60. For its $1,350,000 grading and paving contract and its $170,000 bridge contract on this highway, the contracting firm used the large amount of equipment noted in an accompanying table. Maintenance of the great quantity of equipment required the services of nine mechanics and a stock clerk, acting under a master mechanic. Upkeep and repair work by the service group utilized to the full the facilities of a field garage equipped with a work shop and storeroom.

On the bookkeeping side, the methods of distributing maintenance costs and equipment charges were as well organized as the actual mechanical services. Hourly rental for the various pieces of equipment was charged to the contract items on which the equipment was engaged, as shown on the accompanying equipment report. Maintenance costs for repair work likewise were charged against the equipment items involved, as indicated by a sample time report reproduced herewith. Charges for parts were made originally on a stock-room requisition, not shown, from which they were transferred to the books.

Maintenance Organization — To maintain all equipment on the job in good repair, the master mechanic had a crew consisting of one tractor mechanic, one mechanic for Euclid truck-trailers, two truck mechanics, one tire man, one road service man, one compressor mechanic, one fuel man, one welding operator and a stock clerk. With the cooperation of equipment operators and of some men employed as greasers and oilers on certain units of equipment, this crew took care of all equipment maintenance, as well as all equipment repairs, on the job.

Road Service—Most important duty of the road service man was to make repairs on the road in order to eliminate time lost by having equipment sent to the garage. The road service man also checked on conditions under which equipment worked with a view to avoiding breakdowns and time losses caused by overloading, poor dumping, rough roads and neglect of greasing.

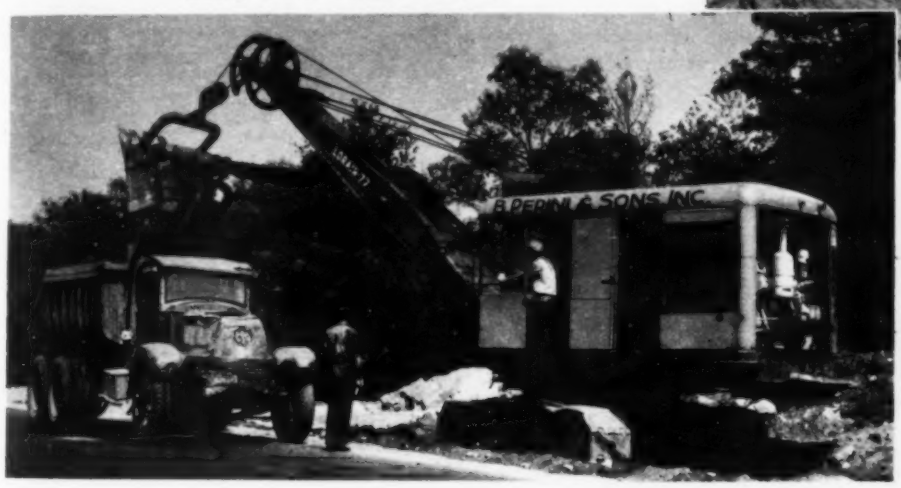
Compressor Maintenance—A compressor mechanic maintained repairs on compressors, wagon drills and jackhammers. This mechanic also was responsible for seeing to it that drill runners and jackhammer men were kept supplied with sharp bits and good steel. Whenever compressors had to be moved, it was his duty to get trucks to tow them. He changed the oil in compressors and motors every 40 hr. and cleaned the filters, both air and oil. As part of his duty, he kept an eye on wagon drills



FUEL TRUCK carries gasoline and fuel oil in separate compartments of 700-gal. tank. In front of oil house, at left, workman is loading bombs for night flares. Behind fuel truck stands high-speed gasoline pump (indicated by arrow and shown above) capable of discharging 30 g.p.m.

ONE HOUR is considered fair time for changing 18.00 x 24-in. tire on Euclid Trac-Truk.

LEDGE EXCAVATION tests endurance of powerful gasoline shovel. On this kind of work vigilant maintenance pays high returns in avoidance of breakdowns.



NEW DIESEL SHOVEL (left), in excellent condition near finish of job, trenches subgrade for parking lane adjacent to main traveled roadway.

and jackhammers to be sure that they were properly oiled and greased.

Fuel Service—Refueling of equipment was done twice a day, the first thing in the morning and again at noon. Fuel was transported from the main tank to the equipment in a 700-gal. two-compartment tank mounted on a Ford 1½-ton chassis. Each compartment had a separate pump and meter, one used for fuel oil and one for gasoline. Lubricating oils were carried in the side racks of the truck in twelve 5-gal. cans holding oils of different viscosities required by individual pieces of equipment. The side racks of the truck also held 25-lb. pails of grease.

All trucks (Macks, Euclids and Fords), refueled at the garage at the end of each day's work. A special pump, designed by the Shell Oil Co. in collaboration with the contractor, delivered gasoline to these vehicles at a maximum discharge rate of 30 g.p.m., in comparison with the ordinary pump rate of 16 g.p.m., effecting a substantial saving in fueling time.

Lubrication — Each power shovel had a greaser to take care of daily greasing. The greaser cleaned the oil and air filters and changed the oil in the motor on a 40-hr. schedule.

Operators on rollers and graders were responsible for the greasing of their units. Cleaning the filters and changing the oil in the motor were done by the grease man from the garage every 40 hr.

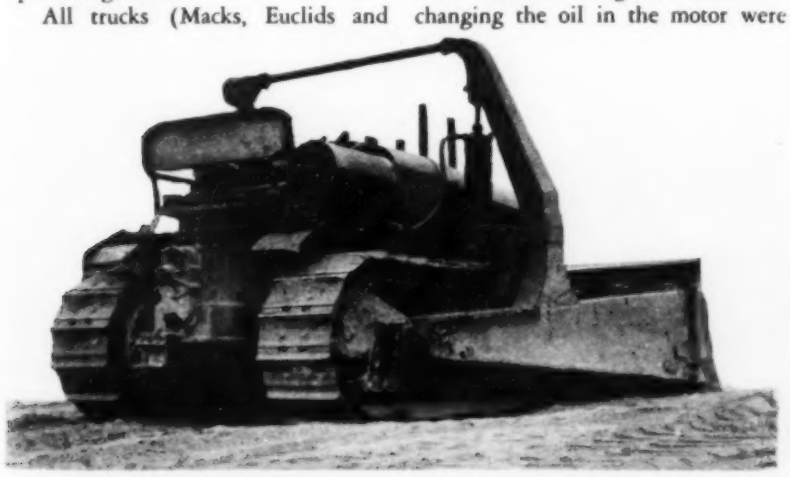
For use on the tractors, the job was equipped with volume grease guns holding 35 lb. each. The fuel truck delivered these guns, filled with grease, to the tractors every morning and returned the empty guns to the garage every night. As part of his regular duties, the grease man changed the oil in tractor motors, cleaned the oil and air filters and checked the transmission and final drive on a 40-hr. schedule.

Euclid operators greased the units which they drove, including the transmissions and rear ends. On his regular 40-hr. routine, the grease man changed the oil in the motors and cleaned the filters.

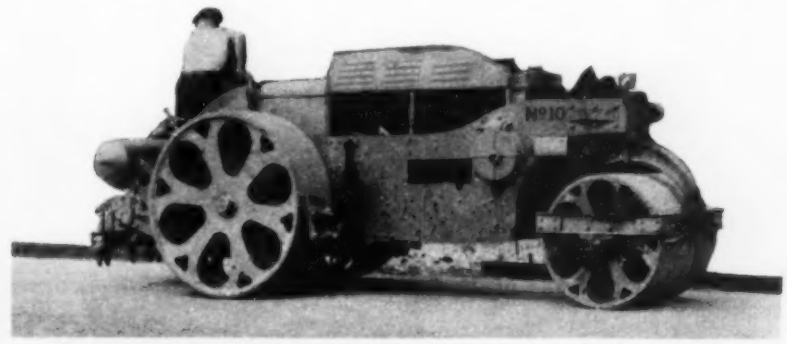
Pneumatic Tires — Tires were checked every other day for underinflation, cuts, wheels out of alignment, lost valve caps and loose tire lugs. Minor repairing and mounting were the duties of the tire man, who changed flat tires on the road. The stock room carried spares of all sizes, and the tire man kept mounted replacements on hand of all tires except the 18.00 x 24-in. size for the Euclids, the wheels of which do not have demountable rims. The job carried 66 of the 18.00 x 24-in. tires, 60 on the Euclids and six in stock.

When the tire man received a call to replace a Euclid flat tire on the road, he took with him on a truck a tire and tube and, also, a special adapter and air hose. Somewhere near the point where the tire was being changed, the Euclid operator or tire man looked for one of the contractor's Ingersoll-Rand 105-c.f.m. mounted compressors that could be dispatched to the unit to supply air. About 1 hr. was considered fair time for the tire man to change one of the large Euclid tires.

Tractors — Duties of the tractor mechanic covered not only the repairing of tractors but also the necessary checking and supervision to see that operating conditions were favorable for maximum performance by the units. This supervision involved constant checking to see that the operators were taking care of the daily



TRACTOR OPERATOR is held responsible for daily greasing with 35-lb. volume grease gun delivered full to unit each morning. Tractor mechanic checks operator's greasing and method of operating to obtain maximum performance from unit.



EACH ROLLER on job is kept greased by its operator and is checked periodically by one of two truck mechanics. Grease man from garage cleans oil and air filters and changes oil in motor every 40 hr.

Mechanics' Daily Time Report — Equipment Repairs

Name of Equipment	Euclid #9		Euclid #7		Mack #12		Mack #17		Grader #4		Tractor #9		Shovel #17		Shovel #34		Pump #32		Ford #79		Sterling #15		Roller #21		Roller #5		LeTourneau #4		Compressor #19		Compressor #3		Tractor #16		Ford #28	
Name of Employee	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
R. Thompson	2		1		1		½		½		3		½		1		½																		
W. Blake					1½		½												3	3	2														
R. Davis	5										3				2																				
J. Cain																							5	5											
I. Miller																									2		3		2		3				
A. Grant																																	5	2	3	

greasing and were operating their units in a competent and careful manner.

Truck-Trailers — A mechanic assigned specifically to the care of the Euclid truck-trailers checked these vehicles daily to see that the brakes were in good condition and the front wheels in alignment. Bottom-dump doors of the trailers were greased and checked regularly to be sure that they closed tightly and dropped no spillage on the roadbed. The mechanic kept an eye on door cables and wheel-winds to see that they were not rubbing on the tires. Fan belts of the motors were kept tight to prevent overheating where low gears were being used.

Trucks — Two truck mechanics on the job served not only the trucks but also the graders, rollers, pumps and superintendents' cars. In some cases these mechanics were called on to do repair or service work on power shovels, tractors and Euclid truck-trailers

Electric Welding — A single-operator electric welding machine was kept busy every hour of the day. Its work was divided between welding and cutting, and its services were in steady demand. In addition, a great deal of cutting was done with gas torches.

Stock Room—A fair stock of parts for the various pieces of equipment was kept on hand. The stock clerk checked fast-moving parts daily to keep a fair supply ahead. As the project was close to the contractor's Framingham, Mass., plant and to Boston, it did not take long to get needed parts from either place. Most of the parts were ordered from the Framingham stock room.

All parts taken out of the stock room were charged by the stock clerk to the individual units on which they were used. In addition, the stock clerk had the responsibility of charging mechanics' time to the various pieces of equipment on which the men worked. All these charges were sent to the main office at Framingham once a week, along with the rental sheet for the equipment.

Equipment on Newburyport Turnpike Job

B. PERINI & SONS, INC., FRAMINGHAM, MASS.

TRACTOR-BULLDOZERS

1 95-hp. diesel Caterpillar RD8
2 75-hp. diesel Caterpillar
3 50-hp. diesel Caterpillar
2 75-hp. gasoline Allis-Chalmers
1 60-hp. gasoline Caterpillar

CARRIER SCRAPERS

2 12-yd. carryall Le Tourneau

COMPRESSORS

5 315 c.f.m. two-stage oil-engine Ingersoll-Rand
1 210 c.f.m. oil-engine Ingersoll-Rand
2 105 c.f.m. gasoline-engine Ingersoll-Rand

POWER SHOVELS AND CRANES

3 1½-yd. diesel Lorain 77
3 1¼-yd. gasoline Lorain 75B
2 1-yd. gasoline Lorain 55
1 2½-yd. gasoline Northwest 80
1 1¾-yd. gasoline Northwest 70
3 Gasoline cranes Lorain 75
1 7½-ton gasoline truck crane Universal

POWER ROLLERS

5 14-ton gasoline Buffalo-Springfield
1 5-ton gasoline Buffalo-Springfield
3 3-ton gasoline, for sidewalks, Buffalo-Springfield
2 12-ton gasoline Galion
1 14-ton gasoline Huber
1 5-ton gasoline Huber

WELDING MACHINE

1 Electric welding generator, gasoline engine, Hobart

TRUCKS

8 Six-wheel Mack 6 AC, six equipped with Gar Wood 10-yd. stone bodies and two equipped with 9-yd. dump bodies.
9 7-yd. Mack 4AC
15 8-yd. water-level bottom-dump trailers Euclid Trac-Truk
12 1½-ton end-dump Ford
4 ½-ton pick-up Ford

POWER GRADERS

3 Warco Model E

PUMPS

3 6-in. self-prime Carter Humdinger, Ford V-8 motor
1 8-in. self-prime Carter Humdinger Hercules motor
2 4-in. centrifugal Labour

WAGON DRILLS and JACKHAMMERS

4 Wagon drills Ingersoll-Rand
2 Wagon drills Cleveland
1 Wagon drill Worthington
10 Jackhammers Ingersoll-Rand
4 Jackhammers Sullivan
2 Jackhammers Cleveland
2 Drill sharpeners Ingersoll-Rand

CONCRETE EQUIPMENT

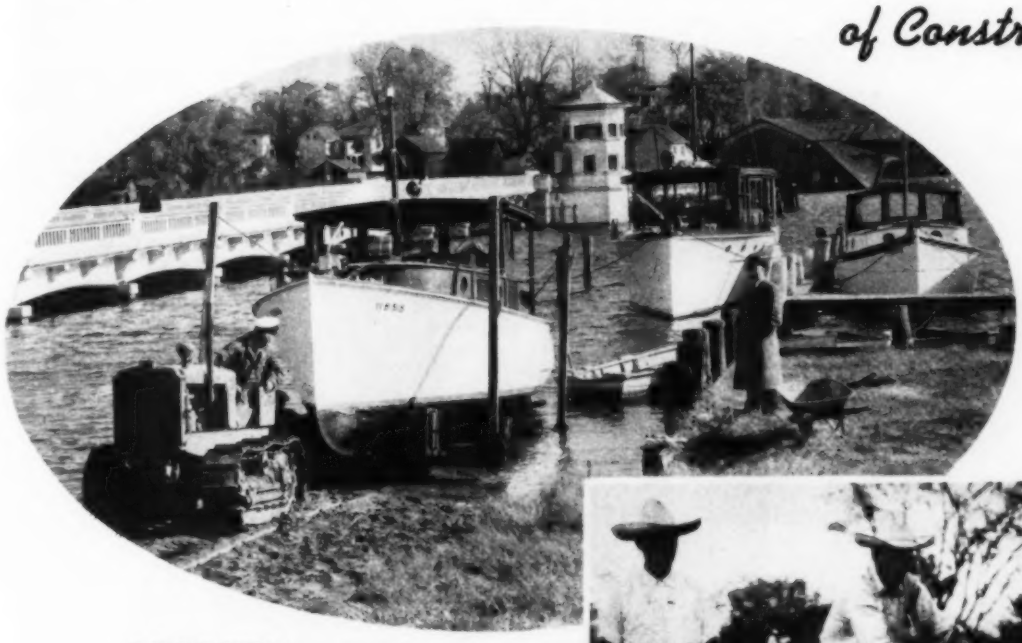
1 27E paver Ransome
1 Belt conveyor Barber-Greene

Partial Daily Report of Equipment Charges

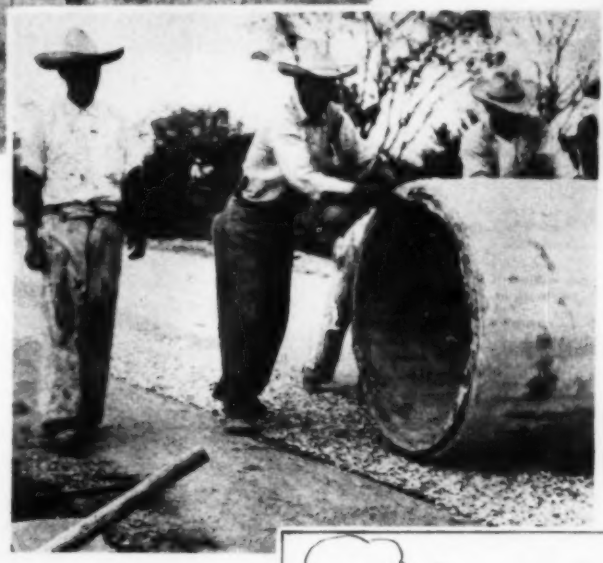
Sections		Overhead bridge		Loam borrow		Ledge exc.		Gravel borrow						
Name of Equipment		AM	PM	AM	PM	AM	PM	AM	PM	Total hours	Rate	Amount	Gas, gal.	Oil, qt.	Fuel oil, gal.
Ford	54	4	4							8	.25	2.00	10		
"	47	4	4							8	.80	6.40	10		
"	61					4	4			8	.45	3.60	10		
Mack	12				7½					7½	2.50	18.75	30	8	
"	14				6½					6½	2.50	16.25	50	8	
"	16								½	½	2.50	1.25	20	8	
"	17								1½	1½	2.50	3.75			
Euclid	9				2			4	1	7	1.80	12.60	50	4	
"	12				2			4	1	7	1.80	12.60	50	4	
Bulldoz.	8				2			4	1½	7½	2.50	18.75	1	15	35
"	9				8					8	2.50	20.00	1	15	30
Shovel	10				1½					1½	3.20	4.80	38		
"	16				2			4	1	7	3.20	22.40	45		
"	24				7½					7½	4.00	30.00	5		30
Crane	23							6	7	13	4.00	62.00	120		
Grader	5							4	3	7	1.00	7.00	45	20	
Roller	19							4	4	8	1.20	9.60	45		
Comp.	10					4	3			7	.60	4.20	20	12	
"	14					4	2			6	1.60	9.60	1	12	20
Grinder	1					4	4			8	.30	2.40			

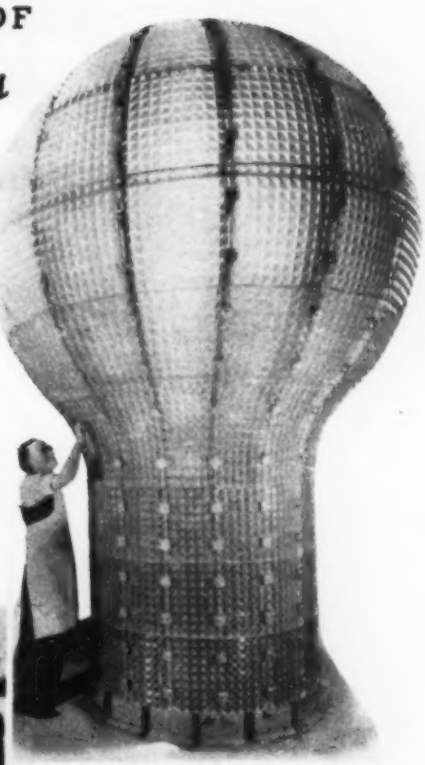
JOB ODDITIES

A MONTHLY PAGE OF *Unusual Features of Construction*



DOUBLE DUTY is performed by this Allis-Chalmers tractor. After operating Euclid scraper to enlarge and level off shipyard of F. C. Berg at Georgetown, Md., machine hauls cruisers out of water on to ways for overhauling.

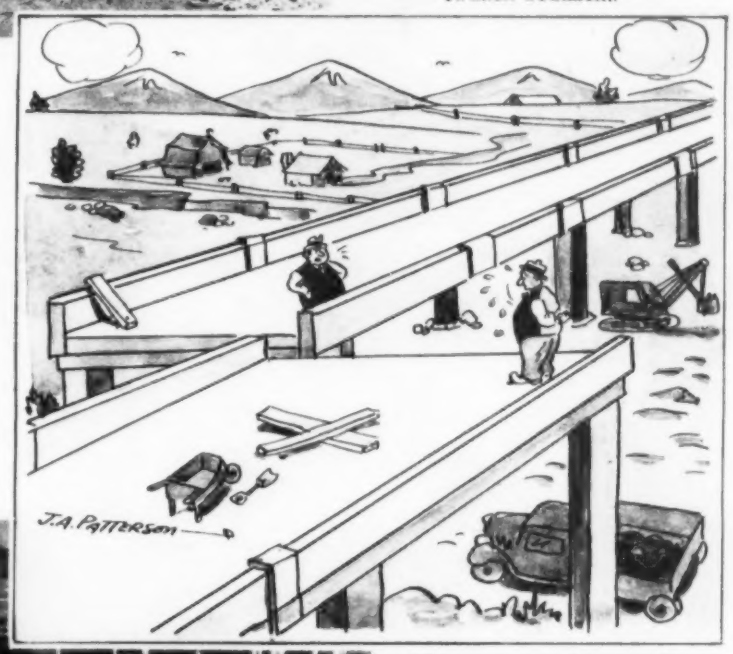




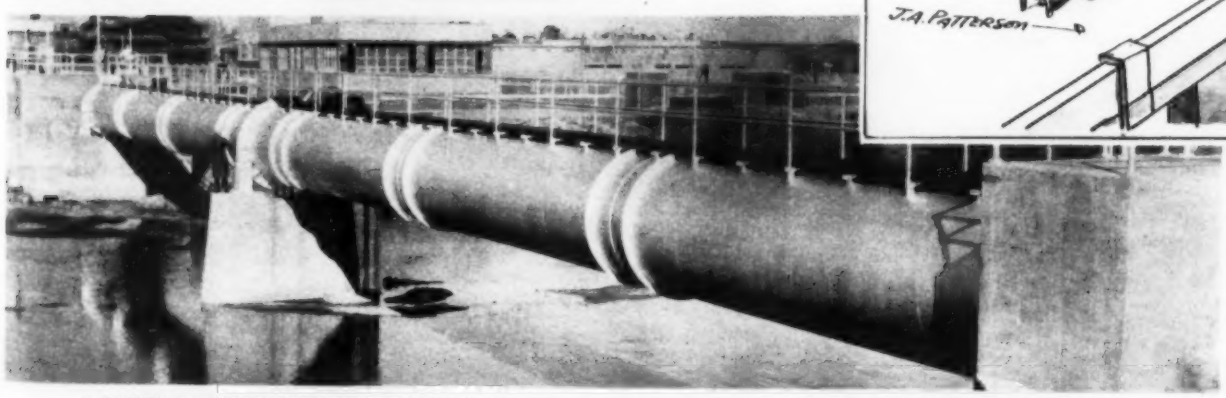
BIG BULB. 14 ft. high caps $100,000 Edison memorial tower 130 ft high, recently erected by Walter Kidde Constructors, Inc., at Menlo Park, N. J., to commemorate invention of incandescent light. Made of amber-tinted Pyrex glass supplied by Corning Glass Works giant bulb on skeleton steel frame weighs 6 tons.

IMPROVISED ROLLER (left), in form of section of precast concrete culvert pipe, is used by Mexican road builders to consolidate crushed stone prior to asphalt penetration treatment.

ROAD SHOW CONTRAST. World's tallest man **(left),** Clifford Thompson, 8 ft. 7 in., 460 lb., poses with Gayle Grer, petite Cleveland miss, on F.W.D. truck in Cleveland Auditorium housing big equipment exhibit during convention of American Road Builders Association.



"Maybe next time you'll go by the blueprints instead of guessing at it."



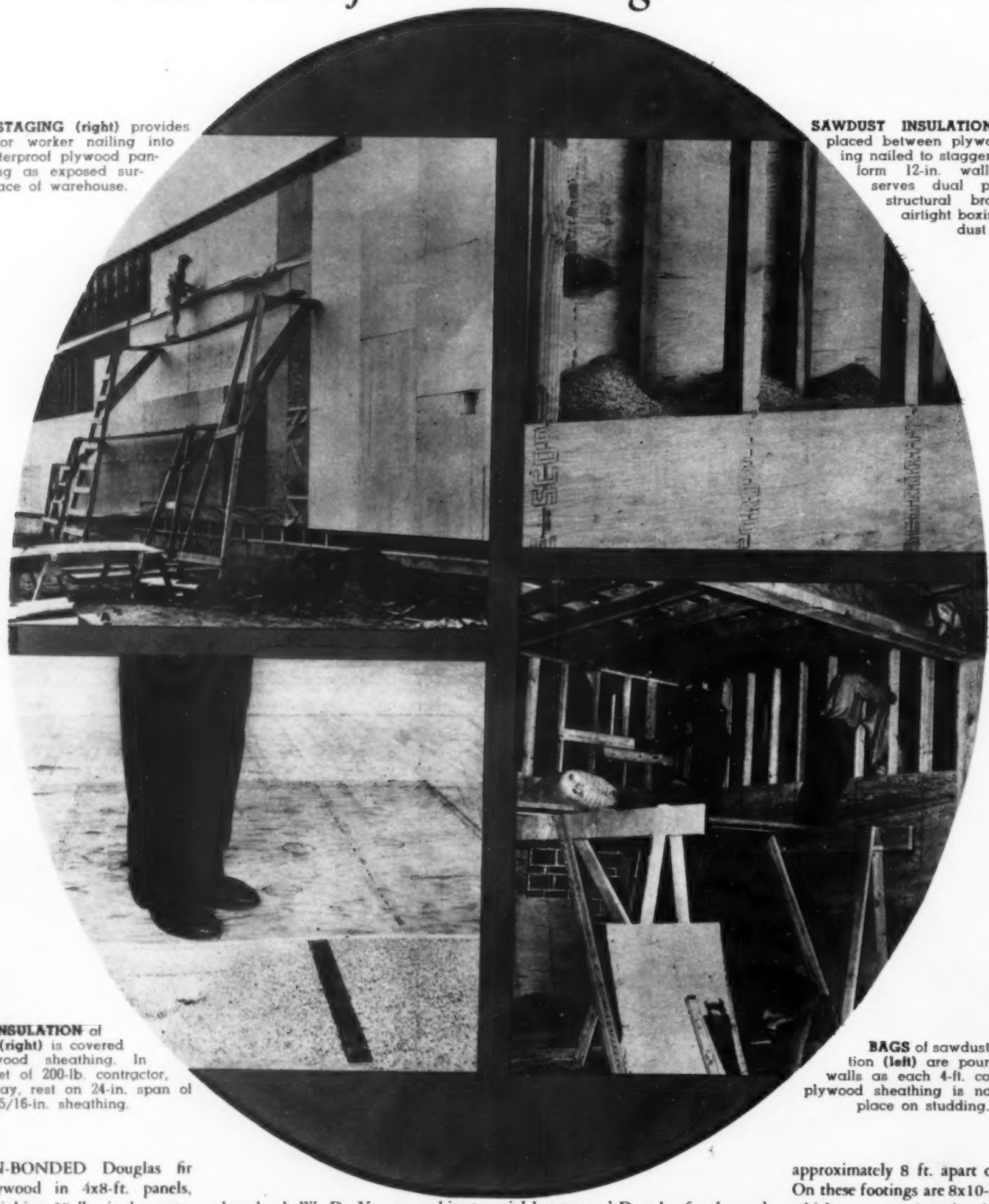
LONGEST UNSUPPORTED PIPE SPAN. 105 ft., carries sewage across Platte River to disposal plant in Denver, Colo. Stiffener rings, electrically welded to 78-in. diameter pipe, ⅜ to 1⅛ in. thick, by shielded-arc process with Lincoln equipment, prevent distortion.

PLYWOOD PANELS

Form Walls for Cold Storage Warehouse

SIMPLE STAGING (right) provides support for worker nailing into place waterproof plywood panels serving as exposed surface of warehouse.

SAWDUST INSULATION (left) is placed between plywood sheathing nailed to staggered studs to form 12-in. wall. Plywood serves dual purpose as structural bracing and airtight boxing for sawdust filler.



FLOOR INSULATION of sawdust **(right)** is covered by plywood sheathing. In photo, feet of 200-lb. contractor, Steve Gray, rest on 24-in. span of 5/16-in. sheathing.

BAGS of sawdust insulation **(left)** are poured into walls as each 4-ft. course of plywood sheathing is nailed in place on studding.

RESIN-BONDED Douglas fir plywood in 4x8-ft. panels, weighing 30 lb., is the material used for the surface of both sides of all of the heavily insulated walls, partitions and ceilings in the 60x180-ft. addition to the cold storage plant for fruit and vegetables of Washington Packers, Inc., at Puyallup, Wash. The new structure, built by Steve R. Gray, contractor, from plans by J. W. De Young, architect, of Portland, Ore., involves a timber frame with double stud walls and partitions 12 in. thick, filled with specially treated sawdust, known as Flakewood. To prevent all possibility of condensation each room is inclosed with a waterproof, vapor-proof paper membrane. Finally the layers of special hot-pressed Douglas fir plywood, made with waterproof synthetic-resin glue, were sprayed with aluminum paint. Through the use of the plywood panels, easily handled by one man, Contractor Gray estimates labor savings of 40 per cent.

In general, the new building is placed on concrete footings spaced approximately 8 ft. apart on centers. On these footings are 8x10-in. girders which support 4x10-in. joists with 16-in. spacing; directly over these joists is placed 5/16-in. Douglas fir plywood. On the surface of this plywood are placed three layers of Vaporseal paper, and then 2x6-in. joists on 24-in. centers are run at right angles to the 4x10-in. joists. Directly over these another set of

2x6s on 16-in. centers is run in the opposite direction. The entire space between these joists is filled with sawdust insulating material, and over this is applied 5/16-in. plywood sheathing. This sheathing is covered with two plies of Vaporseal paper and a conventional tongue-and-groove flooring.

The wall construction, which is identical in both the partition walls and the outside walls, consists of two rows of 2x4-in. studdings on 16-in. centers, placed far enough apart so that the distance between the outer faces of the studs is 12 in. These two rows of studs are staggered to avoid breaking the value of the sawdust insulating material which is placed between them. On the outer face of the studs is 5/16-in. Douglas fir plywood. Over this, on both sides, go three layers of Vaporseal sheathing paper and this, in turn, is covered with ¼-in. resin-bonded plywood.

The ceiling construction consists of 2x8-in. joists on 24-in. centers, directly over and perpendicular to which are 2x4s on 24-in. centers. Under the 2x8-in. joists is plywood sheathing, two layers of Vaporseal paper, and ¼-in. resin-bonded Douglas fir plywood. The space between the joists is filled with insulating material, and on the upper surface of the 2x4s are spread three plies of Vaporseal paper, over which goes, finally, 5/16-in. Douglas fir plywood sheathing.

The roof is a conventional built-up construction.

An interesting piece of equipment, from the contractor's point of view, is the staging shown in the accompanying photograph. This is a light, but sturdy, device which makes quick changes in the erection of staging very simple. These ladder-like arrangements are simply built by nailing two 2x4s to the end of a 2x6-in. piece about 4 ft. long, flaring them sufficiently at the bottom to form effective legs to prevent weaving, and bracing them with pieces of 1x4 or 1x6 in. run from the opposite end of the 2x6 to a point about one-third of the way down on the long 2x4's. Cleats can be nailed readily to the 2x4s, which add to the rigidity and make a convenient ladder for ascending the scaffold.

Bright Paint

Transforms Dirty Masonry

SPECIAL PAINTS applied as recommended by Sherwin-Williams engineers to the facades of The Fair Store, Chicago, brightened the exterior of the large building and greatly modernized its appearance at relatively low cost. Above the second floor the exterior surface of the department store consists mainly of brick and tile. Practical considerations prohibited washing and rinsing before painting. Dirt ingrained in the surfaces of the brick and tile defied attempts to remove it by wire brushing. An air jet was used to blow away loose dirt and dust, and wire brushes served to remove rust and scale from skylights, flashings and fire escapes.

Concrete and stucco paint applied in two coats provided a full, durable film on brick and tile. For the first coat the manufacturer recommended 50 per cent reduction with a reducer specially developed for this type paint. After a 3-day drying period, a second coat was applied without any reducer.

From the second floor down, a synthetic store-front finish was used to obtain great lustre and durability. The same material and color were also applied to all windows of the building. For the first coat, the paint was reduced by addition of ½ to 1 pint of turpentine per gallon, but the second coat was applied straight, both coats being well brushed out. Paint specifications were worked out in cooperation with the engineers.

DULL SURFACES of department store exterior contain dirt ingrained in brick and tile facing.

AFTER TWO COATS of special paint, facades are bright and inviting.

GAIN WHEN Y
GAIN WHEN Y
HAVE YOU CHECKED THESE IMPORTANT POINTS AGAINST YOUR EQUIPMENT?
INITIAL COST
WORKING SPEEDS
UPKEEP COST
TIME LOSSES FOR REPAIRS
STARTING TIME
COST OF FUEL PER GALLON
COST OF LUBRICATING OIL
WORKING LIFE
TRADE-IN VALUE
ALL THESE ENTER INTO YOUR FINAL COST PER YARD ... IT WILL BE LOW IF YOU USE ALLIS-CHALMERS EQUIPMENT

YOU BUY ... GAIN AS YOU WORK

YOU TRADE-IN! ... WITH

YOUR WAY TO LOWER FINAL COST PER YARD

Job profits depend on final cost per yard. That's why an ever-increasing number of contractors are turning to the FASTER POWER of Controlled Ignition Oil Tractors. They know that A-C design does away with extra, pay-robbing deadweight. As a result, they get more power per pound of weight, invest less per horsepower. There's less investment to charge off per yard. They operate at lower costs because their tractors deliver a full, even flow of power on any clean Diesel fuel or furnace oil ... and use standard engine lubricating oils. Thus, A-C users normally save from 1 to 3c per gallon on fuel ... and from a third to a fourth on engine oil. The smooth power your A-C tractor gets from these lower-cost fuels eliminates destructive engine pounding, reduces maintenance and repair costs—another saving per yard. Finally, you get more work done because Controlled Ignition Oil Tractors start instantly in all weather and go right to work ... because more and higher speeds enable you to gain profitable, extra trips on any job ... because Better Balance between power and weight enables A-C FASTER POWER to move greater payloads per horsepower on those extra trips, and ***on every trip.*** Compare your initial investment ... compare the advantages of FASTER POWER on your job ... compare final cost per yard. Ask the Allis-Chalmers dealer!

ALLIS-CHALMERS

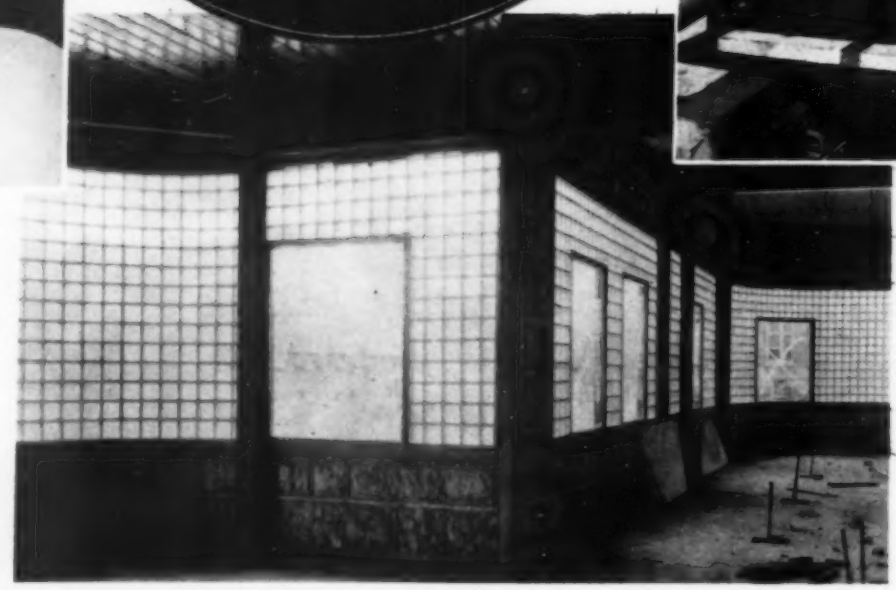
TRACTOR DIVISION—MILWAUKEE, U. S. A.

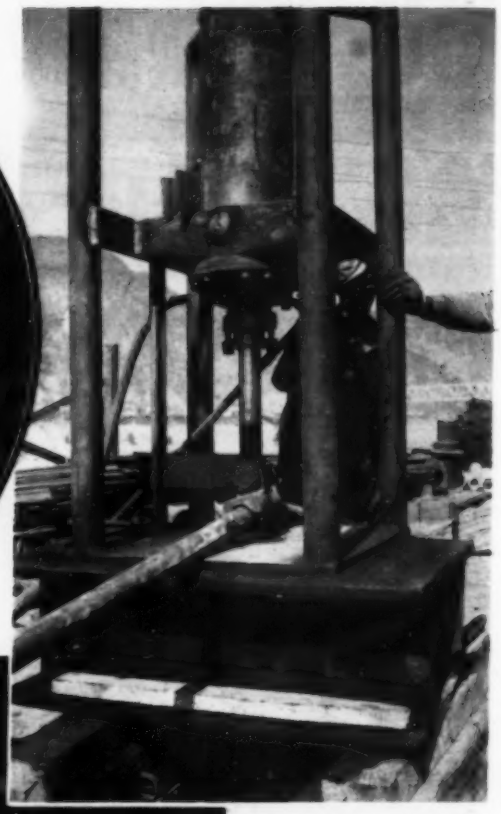
Controlled Ignition
OIL TRACTORS

How They Did It

CONSTRUCTION DETAILS *For Superintendents and Foremen*

THICKNESS OF CONCRETE PAVEMENT. (below) immediately after pouring, is tested by disk and needle apparatus, in use by the Missouri Highway Department. Small tin sheets are placed directly upon finished subgrade at intervals and their locations marked. After concrete slab has been poured and finished, but before cement has set, needle is pressed down through wet concrete until its point strikes tin plate on subgrade. Circular disk which slides up or down along needle is allowed to rest upon surface of concrete. Graduations on shank of needle indicate thickness of poured concrete.

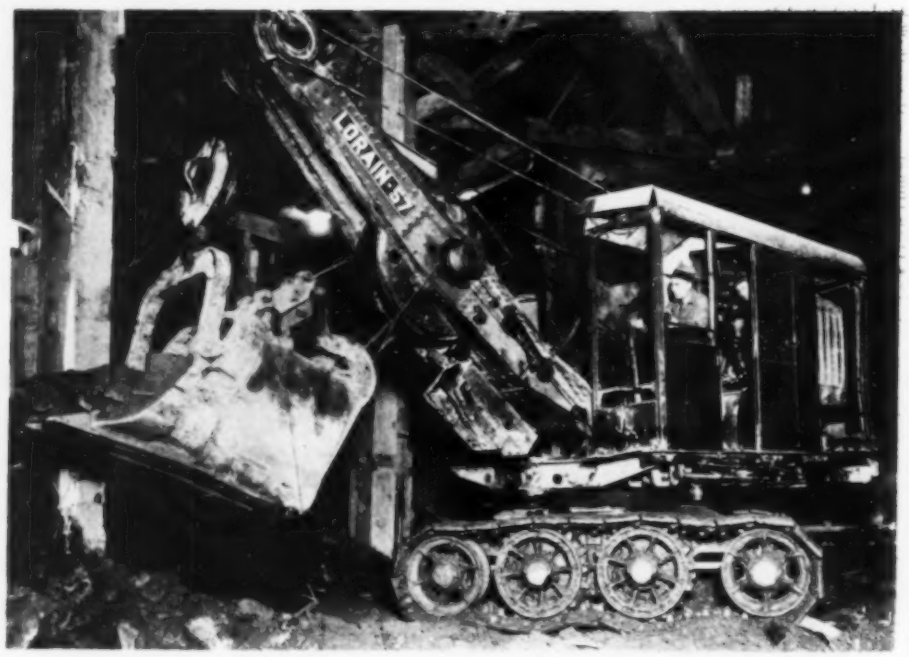




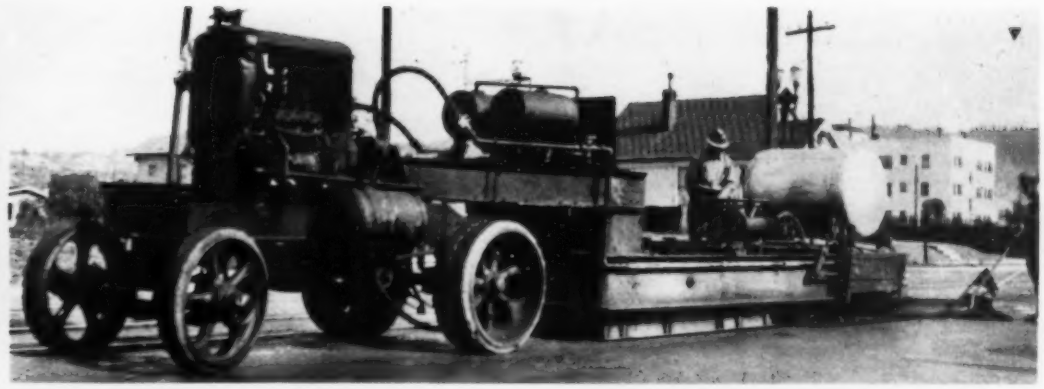
BENT PIPE at Grand Coulee dam in Washington is straightened by this machine, in which piston rod from vertical cylinder mounted in heavy steel frame and operated by compressed air, exerts pressure on tube to be reconditioned for re-use by Mason-Walsh-Atkinson-Kier Co., contractors.

ROCK WOOL BATS (right) inside exterior steel walls provide insulation for new steel-and-glass, air-conditioned Research Laboratory of American Rolling Mill Co., at Middletown, Ohio. Wall sections are of Steelox panels covered on the inside by No. 18 gage walnut-finished furniture steel.

TESTING THICKNESS (above) of protective enamel coating on 55-in. mortar-lined, welded steel pipe of distribution system for Colorado River aqueduct in California is done with electric brush. Brush shows spark if thickness of coating is less than minimum required. To prevent tuberculation, pipe of 55-in. maximum diameter has ½-in. thick mortar lining, centrifugally applied by spinning pipe sections. Outside of pipe receives ¾-in. Gunite coating. Fabrication of pipe for Metropolitan Water District of Southern California was sublet to Consolidated Steel Corp., of Los Angeles, by J. F. Shea Co., general contractor, of Los Angeles.

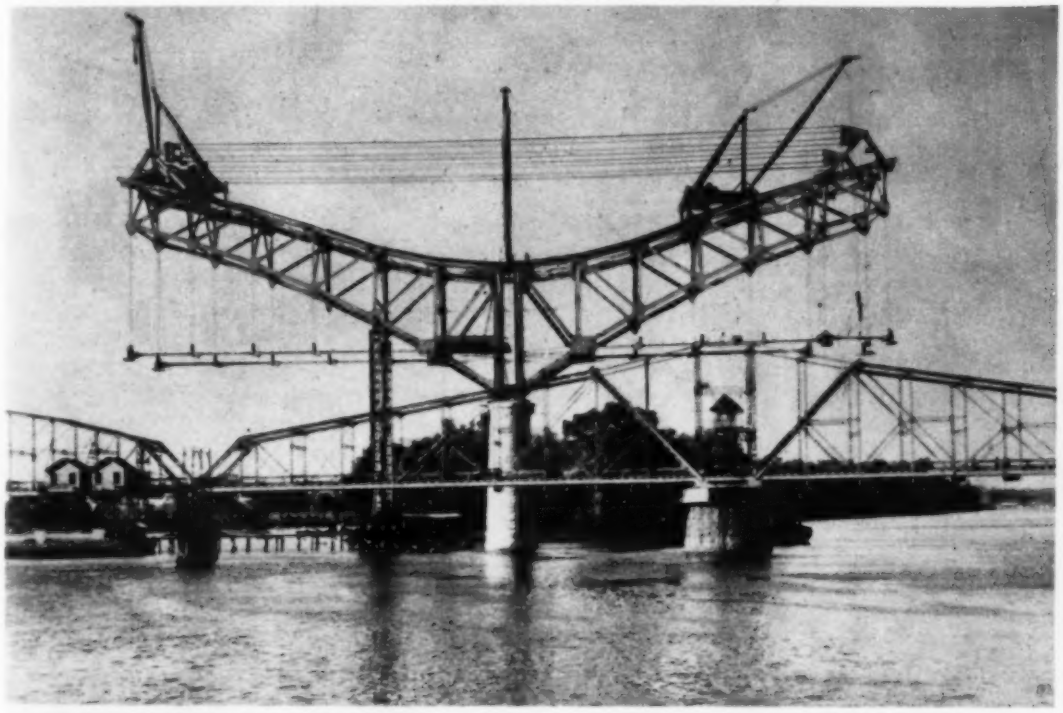


SHORTENED BOOM AND DIPPER STICK adapt Lorain 1¼-yd. power shovel to excavation with low headroom in cramped quarters for section of Sixth Ave. subway project in New York City, being built by Rosoff-Brader Construction Co. Standard 19-ft. boom is reduced in length to 12 ft. while dipper stick, ordinarily 16 to 18 ft. long, is shortened to 10 ft. Unit is powered by 4-cylinder diesel engine and is mounted on crawlers of center-drive design.



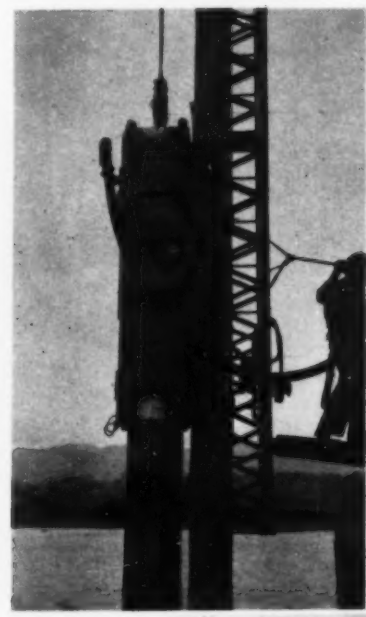
CORRUGATIONS IN PAVEMENT of asphaltic-concrete type in Berkeley, Calif., are removed by Spearwell heater-planer, designed to heat surface and plane it off in one continuous operation at cost of about 1¢ per square foot. Machine requires only 2 operators and has capacity of treating 20,000 sq.ft. of pavement per 8-hr. day. Photo at right shows complete heating and planing unit hauled by tractor, while view at left illustrates detail of end of blade depositing cut material in windrow at side.

SHOULDER ROLLER, made from front wheel of old steam road roller towed by patrol grader, enabled Southern Stone Corp., of Alderson, W. Va., to consolidate extreme outer edges of shoulder difficult to reach with conventional three-wheel roller. Wheel filled with concrete weighs 2,500 lb. —Photo from **C. R. Nuzum**, junior engineer, West Virginia State Highway Department.



CANTILEVER METHOD is used by Bethlehem Steel Co. to erect two 600-ft. steel arch spans of Connecticut River bridge between Middletown and Portland, for Connecticut Highway Department. From center pier, east and west spans are erected simultaneously by use of 24 cables passing through sheaves of temporary connection to top chord of arch members. Attachment includes jacks for tightening 1½-in. cables, 16,000 ft. in length, stressed 65,000 lb., including dead and wind load.—Photo from **E. C. Welden**, deputy highway commissioner of Connecticut.

SPECIAL PILE-DRIVING MAST (below) 70 ft. high, for use on crawler type excavators, designed by Valentine B. Libby, chief engineer, Hawaiian Contracting Co., handles 70-ft. wood piles on bridge widening in Honolulu. Provision is made at mast top for both hammer and pile lines. Idler sheaves are placed in mast where boom point connects, allowing both hammer and pile lines to be reeved through this point. Hammer **(left)** is a 7,000-lb. McKiernan-Terry.—Photo from **Allen P. Hahn**, manager, Edward R. Bacon Co., Honolulu, T. H.



WANTED—
Photos of Details

The Editor of CONSTRUCTION Methods and Equipment wants photographs or sketches illustrating interesting DETAILS of method or equipment and will pay for those he finds acceptable for publication. Hasn't your job produced some DETAIL that might be illustrated on this page? Send along a picture of it; we'll return it promptly if we can't use it.

Planning and Plant for

TWENTY-SIXTH OF A SERIES OF ARTICLES

HEAVY CONSTRUCTION

Principles and Practices of Job Layout and Selection and Use of Equipment

By ADOLPH J. ACKERMAN and CHARLES H. LOCHER
Construction Engineer *Construction Consultant*

• 26 •
Human Relations

AT ONE of the recent conventions where the latest models of construction machinery were on display, representing the last word in efficiency, greater speed and labor saving, one huge and awe-inspiring machine was attracting special attention, and within a relatively short time three interesting comments were overheard:

The first one came from a laboring man: "My God! look at that contraption. That will put 200 men out of work."

A county engineer came along and, after gazing at the machine, remarked to his neighbor, "If we had one of those machines in our county we could keep it going for a long time and put a bunch of our men to work."

Finally, a third man came along, his eyes beaming with enthusiasm, and he was heard to remark, "This may be the forerunner of the type of machinery which will be necessary for the construction of superhighways across the United States. If we can bring the cost of highway construction down by such devices we will some day see such work going forward on a larger scale than was ever seen in this country."

The first man was thinking of himself and of today; the third man was thinking of the future. The viewpoints of both men deserve careful recognition.

BIG AUDIENCE of construction workers turns out to hear talk on Safety by the "super"

Trend of Mechanization

As was pointed out in the first chapter of this series, the future of heavy construction will depend largely on new developments in plant and procedure which will spell lower costs, and the construction industry will continue to move in the direction of greater mechanization. The National Resources Committee in June, 1937, reported that "While mechanical power has been instrumental in separating the worker from his tools and agriculture from industry, it has definitely created more callings and more employment than it eliminated." While this statement is fundamentally sound, it is not enough to accept it without considering related problems of employment.

The heavy construction industry is, at best, a field where employment is at all times on a temporary basis. Even though a large job may last several years it eventually comes to an end, resulting in the necessary scattering of workers to other regions and attendant losses and disruption of a competent organization. Greater mechanization will lead to a reduction in the number of men required on a job or may eliminate certain classes of labor entirely, but at the same time it will result in increasing the wages of the equipment operators. The housing and sanitary facilities for employees engaged on projects in remote localities will improve as the demand for such facilities is reduced. In the end all this will produce lower costs. The construction industry can best contribute to the permanent stability of employment and national economy not by arbitrarily creating a number of temporary jobs, but by reducing costs to a point where a greater number of important structures and improvements can be erected which will give new opportunities to the inhabitants of the regions where such projects are undertaken.

A striking example of this trend is shown in the accompanying illustrations of the construction of the All-American canal in California, which is 80 mi. long and will cost $40,000,000. This canal, when completed, will provide new agricultural opportunities and other means of livelihood for a large number of people for generations to come. In the old days, when horse-drawn Fresno scrapers were among the standard methods of earth moving, cost and the time required made the construction of this canal prohibitive. Under modern methods, using machines which, under the control of a single man, move 12 to 14 cu.yd. of earth every minute, the canal can be built within a period of only a few years and for about one-third of the cost.

Another example of a vast project made possible by improvements in mechanization is the Colorado River aqueduct. Here a type of tunnel construction which formerly cost between $1,200,000 and $2,000,000 per mile is now being done for $600,000 per mile. A crew of 10 men can drive a large tunnel a distance of 10 ft. within 8 hr., thus making possible speed and production records which were unheard of even a few years ago.

CAMP COMMUNITY building provides meeting room, small auditorium, library, billiard and game room, refreshment stand, post office and camp manager's headquarters.

NEATNESS around workers' dormitories **(right)** promotes cooperation from occupants in helping to maintain their quarters.

WELL EQUIPPED HOSPITAL is indispensable on construction job. X-ray machine quickly discloses extent of injuries.

GOOD EATING PLACE deserves pleasing exterior appearance such as this well-kept dining hall at Guntersville Dam.

WORKERS who are encouraged to devote their spare time to improvements around their houses in neat camp acquire habits of care and pride which benefit job.

Lower construction costs, the use of electric and other types of power and new metals will inevitably open up new possibilities in the field of construction which can now merely be discussed in terms of prophecies. To cite a few examples, we need only consider some of the needs of the country which will soon be upon us or are already serious limitations in our present day life: Transcontinental superhighways, with special consideration for safety-with-speed; railroad realignments to improve speed and comfort of travel; subways and other street traffic eliminations in large cities; tunnels for water supplies, railroad and highway improvements; canals for water diversion to improve agricultural opportunities; flood control measures of all kinds; harbor improvements; as well as the much discussed housing programs on large scales, and the construction of buildings of all kinds.

Based on his own muscular ability, a laborer's productive ability is considerably less than that of a horse, and his earning capacity is in about the same class. His status improves as he acquires the ability to use tools and machinery. The modern approach toward mechanization utilizes labor-saving and automatic devices wherever lower unit costs can be obtained thereby. The privilege of using the most efficient tools and methods carries with it an obligation to help in the readjustment of the workers who may be adversely affected thereby. While our workmen are, in general, capable of readily shifting around in different types of work and to different localities, it would be a short-sighted policy on the part of employers to dismiss the problem of the working men on the basis of this fact. It would be equally serious to deny employers the necessary latitude under which such obligations can best be met.

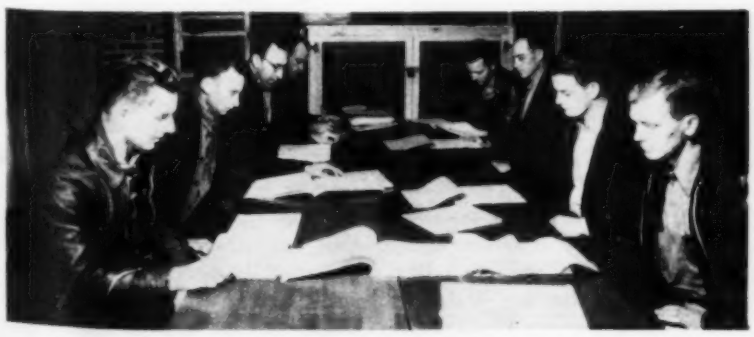
Further dangers arise if sudden increases or excessive wage rates are introduced before the construction industry is able to absorb them under existing highly competitive conditions, because the inevitable result is that mechanization is accelerated and forced on to the industry in such a manner as to affect adversely those who were to be benefited by the increased rates. In a field where arbitrary or unsound wage rates exist, simple economics will dictate either the adoption of less efficient methods, which may, however, spell lower costs by doing the job some other way, or the invention of some new and radically different method, or they may lead to a decision to redesign the structure in order to eliminate as far as possible certain trades which demand an excessive wage. Conflicts arising in these matters can be adjusted as long as everyone concerned maintains an attitude of reasonableness.

Another question which may accelerate mechanization if the answer is unfavorable is: "Will the workman be as dependable as a machine?" Any arbitrary and unwarranted shutdown of an operation which is part of a long series and which may be the key to continued employment for a large number of other workmen will lead to very active and definite efforts to mechanize the most vulnerable point. It is, of course, equally important that the employer be dependable from the viewpoint of the worker.

Welfare of Employees on Construction Jobs

On most large construction jobs it is now almost standard practice for constructors to recognize certain obligations toward the community which they are about to assemble for a new project, by providing such basic facilities or necessities as sanitation, electric power and light, ice, garbage disposal, health and safety measures, a school, forms of amusement and similar facilities. The personnel of the heavy construction industry is composed of many exceptionally capable and widely experienced craftsmen and workmen of all kinds, and

WOOD-WORKING SHOP is always popular during spare time for making useful articles for camp home.



MEN interested in their work want to learn more about it. Here group is studying diesel engine and method of operation.

LIBRARY FACILITIES offer opportunities for spending to advantage many off-shift hours.

in following their trades they are obliged to shift over the country from job to job as one is completed and another one started. The ability and quality of these people is often superior to that found in other industries where the workmen are privileged to enjoy the opportunities of a more stable community life. Many constructors have looked forward to the day when they can provide for their employees those facilities of community life which will assure a standard of living more in keeping with the quality of the employees and their families, and under which the children of such families can pursue the normal opportunities to which they are entitled and which diligent workmen are constantly striving to obtain for their families.

During the past decades there has been marked improvements in this respect, but the contractor who is obliged to bid on a competitive basis for his work can go only so far in the type of facilities which he includes in his bid; otherwise he faces the danger of losing the job. Some important contributions in this respect have been made by public agencies and owners for whom the projects are being constructed, by stipulating in their specifications and contracts that more extensive facilities and better living conditions be provided. Such agencies are willing to pay the additional costs resulting from these demands. It is safe to say, however, that contractors who are in a position to house their employees in good quarters and give them a better standard of community life are able to give the client a substantial and definite return in the form of better progress and better quality of workmanship.

The accompanying illustrations show some of the activities and types of living conditions which have been established on the T.V.A. construction projects in accordance with standards advocated for many years by Dr. Arthur E. Morgan, and the methods and results are deserving of considerable study. Similar policies in industrial concerns have long ago established the merits of such programs.

Building an Organization

While this series of articles has discussed primarily the construction plant and its importance on large projects, we must not lose sight of the men behind the machines and the general organization required to put the job across. There is nothing more important than a competent organization which has been working together for a long time and always comes back to the fold when a new job is ready to start. In such an organization every man knows what his part of the job is, what is expected of the next man and how to work together and cooperate for the greatest common good.

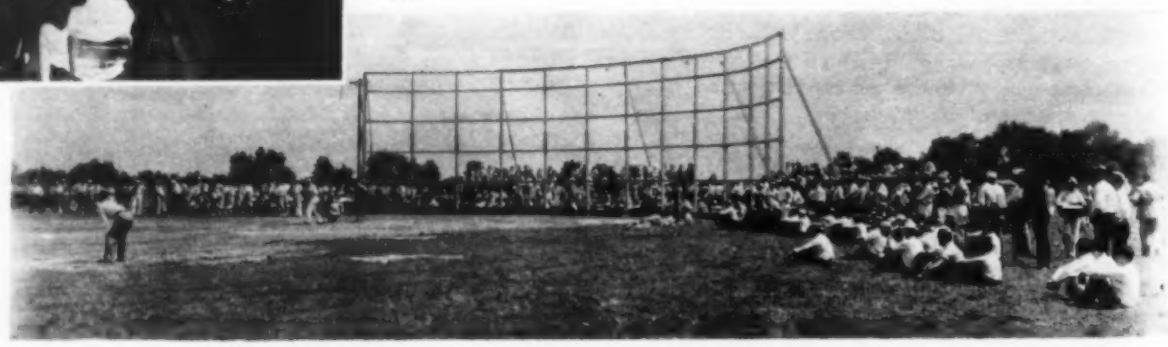
The able contractor is continually trying to keep his organization built up to par and to find new leaders. He must at all times maintain a proper balance among apprentices, helpers, skilled men, straw bosses and foremen on up to assistant superintendents and superintendent. As long as he seeks to grant adequate reward for meritorious work and to encourage advancement from one step to another he is certain to have a competent and loyal organization. This may even be augmented by a definite training program in order to assure the process under which a future superintendent comes up through the ranks. The leaders who are developed in this manner thoroughly understand their obligations to the men under them and they also understand the individual problems of their men.

This process of recognizing ability and helping able men to get ahead is the best means of building up initiative and skill throughout the organization, and is fundamental to the development of a more stable construction industry.

The contractor and his superintendent have great responsibilities and obligations towards their employees. They are obliged to entrust the safety of large bodies of men to others, such as foremen, straw bosses, truck drivers, locomotive runners and hoist runners. This requires implicit confidence and cooperation and a thorough knowledge of the past record of employees who are entrusted with such responsibilities. Here again the effect of the continually growing and improving organization rising up from the ranks leads to the best feeling of responsibility and obligation among the men toward each other.

INTERESTING FACILITIES where wives of workers may employ their spare time pay big returns.

EMPLOYEES can do their best work when they know that their children have adequate care and opportunities.



BASEBALL provides pleasant diversion for everyone in camp on Sunday.

Transition in Labor Relations

It seems unfortunate that the classification of men into two groups of labor and management is sometimes carried to such extremes that it results in unnecessary disputes, antagonisms and petty grievances which are built up to the point where they destroy confidence on both sides, with the inevitable result that many competent men through their own, or directed acts, are denied their normal opportunities. Arbitrary mass action or coercion breaks up an organization, destroys morale and inevitably diverts the responsibility of the employer regarding the welfare of his men. The welfare of labor depends on the welfare of the employer, and if the employer is denied the opportunity to meet competitive conditions his entire organization suffers the loss.

In discussing employee relationship problems recently with a manager of a large company which had experienced no unrest or labor troubles, whereas some other companies in the same industry were confronted with serious disputes, the manager explained: "We have attempted at all times to anticipate the reasonable needs of our employees and to provide for them in such a manner that they have no occasion to become dissatisfied." Such provisions consisted of improved housing conditions, community entertainment facilities, good working conditions, sanitary and health measures, and definite efforts to meet such problems as unemployment, seasonal reductions in force and security during old age.

Many labor disputes over small matters grow to unreasonable proportions simply because of the way they were approached or because of the arbitrary manner in which settlement was attempted. A contractor owes it to his men to approach the settlement of a dispute in a manner

which will generate confidence and assurance that they are getting a fair deal. Labor disputes have been known to exist for some 600 years and no doubt they will exist for many centuries to come, but as long as they are handled in a fair and considerate manner there should be little occasion for disruption and serious consequences.

One of the great obligations which a contractor, manager or supervisor has on a construction job is to understand his men. Many times, if he understands the worries of an individual, he may be able to encourage him in a manner that will produce lasting benefits. Frequently he can shift a man from one job to another and help the man to find himself "by taking a square peg out of a round hole" and giving the man a new chance. Adjustments made within the organization invariably lead to better feeling and encouragement and are far more effective in avoiding stagnation than the arbitrary process of infusing new blood.

On one large job a great improvement in morale occurred by announcing that, in case layoffs were necessary due to curtailment of work, at least one week's notice would be given. This promptly placed the conscientious and reliable men in a separate category from the shirkers and those who were apt to violate established rules for which they were liable to face immediate dismissal. Not only was this atmosphere of recognition established, but the worry of living on the job from day to day without any feeling of security was eliminated.

In closing it may be well to enumerate certain points which must at all times prevail if the construction industry is to move forward for the greatest common good:

1. Operate at maximum efficiency and skill of the constructors.
2. Build at lowest possible cost to the owner.
3. Pay highest possible wages consistent with a sound position for the industry.
4. Provide the best possible and safest working conditions for the men.
5. Promote greater continuity of employment.
6. Assure the opportunity for developing initiative, skill, ambition and loyalty of every employee.
7. Assure unhampered means for honestly recognizing and rewarding meritorious work and initiative.
8. Assure the opportunity for advancement and the constant building up of a better organization from apprentices on up.
9. Help to promote greater self-sufficiency and independence for every man.
10. When you engage a man's services be sure you also engage his good will.

In Retrospect

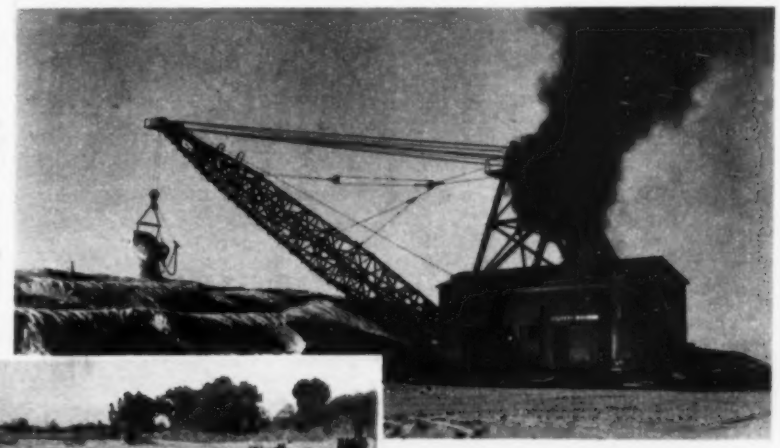
With this chapter this series of articles comes to a close. It seems safe to say, in retrospect, that if the author had known in advance that the series would run to 26 chapters, the assignment would have appeared too appalling, and by the same token the publishers would have laughed at the brazen idea of imposing upon the good nature of the readers for more than two years, so that in all probability the series would never have been written.

But the idea, originally suggested by the founder of CONSTRUCTION *Methods and Equipment,* S. T. Henry, was made to sound simple enough — only ten chapters were wanted, and the editorial staff of this magazine would help in every way to set them up. The authors at first protested that "Heavy Construction" was a practical business, and could never be adequately presented in text form. Any attempt to write on such a subject, they contended, would sound "too theoretical" and as such would be dismissed by the practical construction man. To this came the devastating reply, "How do you know? You haven't tried it as yet." Finally, the work of preparing the chapters got under way with some obvious misgivings.

It soon became evident that the so-called simple process of writing which, to an editor, apparently means to lean back in a swivel chair and dictate great gobs of wisdom to a secretary, actually becomes a serious job of writing and rewriting, research and intensive study, if anything worth while is to come out of it. But there was no turning back, and when readers began to show their interest and lend encouragement, there was no stopping the authors until they had generally "covered" the subject. In this manner, the scope of the series was extended from time to time until it finally reached its present proportions.

Generous assistance and helpful suggestions came from many sides. Special credit is due a large number of the authors' former associates on the Tennessee Valley Authority projects, including Robert T. Colburn, Frank T. Matthias, R. E. Karp, H. P. Maxton, P. H. Kline, W. I. Self, T. N. Whitehouse, George P. Jessup, Miss Kathryn Hines, and others. Special appreciation is extended to Arthur E. Morgan, chairman, and Carl A. Bock, assistant chief engineer, on the T.V.A. projects for permission to describe and illustrate the many activities on these projects.

Among the many manufacturers of construction equipment who cooperated in the preparation of the articles by furnishing illustrations, technical data or valuable suggestions are: Allis-Chalmers Manufacturing Co., American Hoist & Derrick Co., American Steel & Wire Co., Austin-Western Road Machinery Co., Bucyrus-Erie Co., Byron-Jackson Co., Caterpillar Tractor Co., Fuller Co., Ingersoll-Rand Co., Insley Mfg. Co., Koehring Co., A. Leschen & Sons Rope Co., R. G. LeTourneau, Inc., Lidgerwood Mfg. Co., Mack - International Truck Corp., McKiernan-Terry Corp., Morris Machine Works, Moretrench Corp., Northwest Engineering Co., E. G. Robinson Co., Sauerman Bros., Sullivan Machinery Co., Thew Shovel Co., Union Iron Works, Vulcan Iron Works.



HUGE MODERN WALKING DRAGLINES with 12-yd. buckets and 175-ft. booms build All-American canal.

HORSE-DRAWN FRESNO SCRAPERS building section of All-American canal by obsolete methods to provide emergency relief employment.

The photographic files of CONSTRUCTION *Methods and Equipment* were an invaluable source for illustrating the text, and a number of engineering and construction firms, as well as the U. S. Engineer Department and the Bureau of Reclamation, furnished useful information. In several cases the authors went beyond their own experiences and drew from published records on other jobs in order to round out the scope of the series of articles in all phases on construction. This was done to provide a more useful reference for the student in heavy construction. In spite of careful checks, several errors or misstatements have appeared. Some have already been corrected. The authors would appreciate any suggestions or criticisms the readers may wish to offer.

If the authors have succeeded, first, in compiling a useful reference for the construction man, and, second, in pointing out to what extent Heavy Construction is an art capable of scientific analysis, they will feel amply rewarded for their efforts. But, Heavy Construction will always remain an art because to its science must be added the experience, ability, ingenuity, initiative, cooperative effort and courage of the practical builder. Every man from the waterboy to the president contributes his share in providing such qualities, and these do not come from "book-learning."

Present and Accounted For —

A Page of PERSONALITIES

WALTER J. DRUMMOND, president of the Beaver Engineering & Contracting Co., of New York City, is newly elected president of General Contractors Association of New York.

ILLINOIS CONTRACTORS ASSOCIATION, affiliated with A.G.C., installs new officers and Board of Directors. Officers, left to right (seated): Fred Schaefer, vice-president; Franklin C. Nelch, president; A. H. Hunter, secretary. Directors (standing): Orrie Dunlap, of Edwardsville; Henry Berenz, of Bloomington; C. J. Moritz, of Effingham; Otto Milburn, of Rockford; and H. R. Cawood, of Mt. Vernon. Not present in picture, E.S.Hurwich, treasurer and John E. Bretz, director.

PENNSYLVANIA ROAD STABILIZATION, (right) noted elsewhere in this issue, is directed for State Department of Highways by G. A. RAHN (right), research engineer, and R. W. LERCH, materials engineer.

SUPERVISING STABILIZATION on Pennsylvania road construction project described elsewhere in these pages are (left to right): H. C. ANDERSON and J. F. SHULER, assistant construction engineers, District 1, Franklin, Pa.; P. W. WOODRING, junior materials engineer, testing laboratory, Harrisburg; M. H. JAMIESON, project engineer; T. MILLER, contractor's foreman in charge of road mixing; and P. J. SCHNEEBERGER, superintendent, Holmes Construction Co., contractor, Wooster, Ohio.

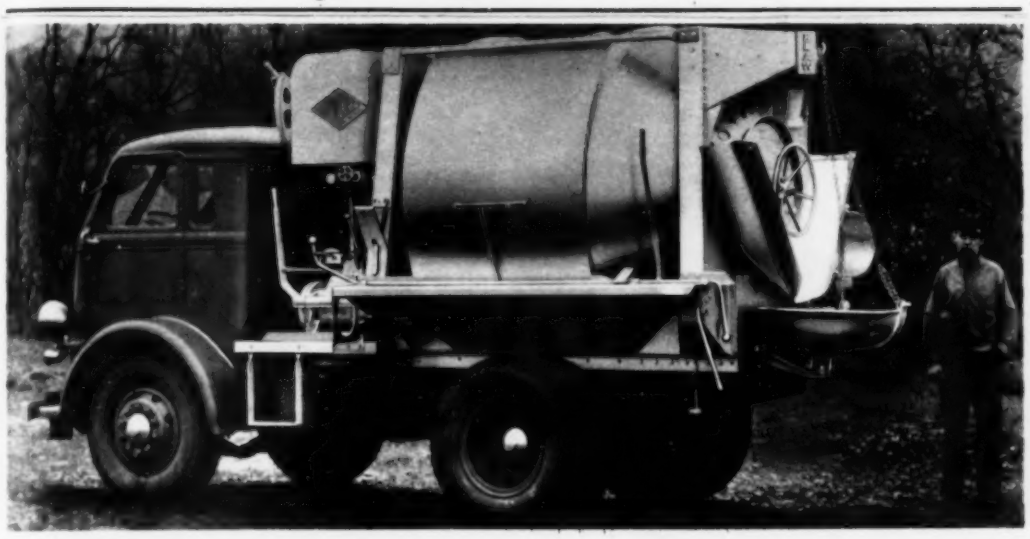
HOWARD S. REED (above) is new state highway engineer of Arizona, succeeding late Thomas S. O'Connell. Mr. Reed was formerly state director for Federal Public Works Administration in Arizona.

HENRY E. RIGGS, (below) professor of civil engineering, University of Michigan, assumed office as president of American Society of Civil Engineers at that organization's annual meeting in New York City in January. In addition to his collegiate work Dr. Riggs has specialized, as consultant to railroads and utilities, in cases dealing with valuation, depreciation, taxation and rate making. He has served society as director and vice-president.

CONSTRUCTION EQUIPMENT NEWS

(ALL RIGHTS RESERVED)

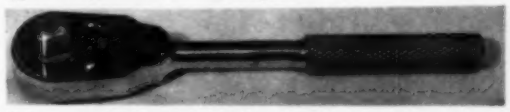
Review of Construction Machinery and Materials for MARCH, 1938



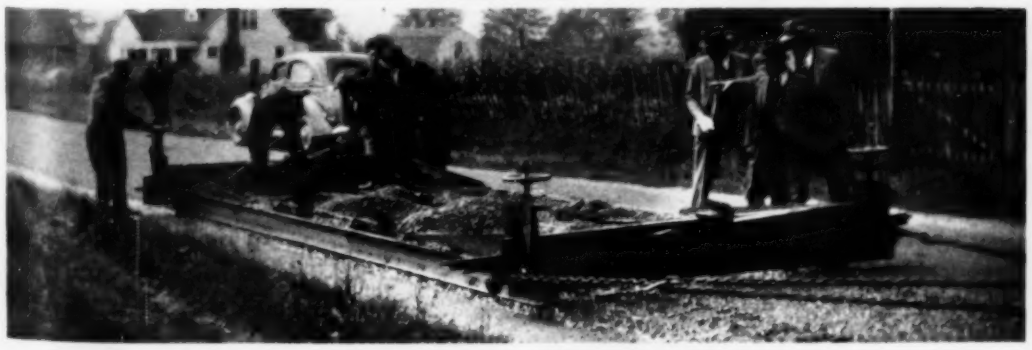
CONCRETE MIXING TRUCKS in 3½- and 4-cu.yd. sizes have been added to Blaw-Knox line and company has incorporated in their design and construction major improvements and operating features as follows: (1) Alloy steel mixing drums and blades; (2) improvement in accuracy of water measurement by patented overflow arrangement which eliminates errors caused by splashing of water in transit or inaccurate measurement while truck is on slope; (3) machined steel charging and discharging doors and machined cast steel replaceable door seats; (4) oversize bearings and rollers for support of drum are sealed against concrete and dust. Additional safety feature: — gasoline tank is now located on catwalk rather than over engine itself and controls are located in reach of operator without making it necessary for him to lean over transmission machinery. — **Blaw Knox Co. Pittsburgh, Pa.**

TWO-PIECE BODY RENEWABLE LIP DIPPER in capacities from ¾ to 18 cu.yd. has renewable lips dovetailed and keyed into front and held in position by "U" bolts through back. Lips are made in variety of shapes and tapers and with various degrees of sharpness on cutting edge depending on nature of material to be dug. Various types of teeth also are available. — **American Manganese Steel Co., 379 E. 14th St., Chicago Heights, Ill.**

REVERSIBLE RACHET HANDLE for ⅜-in. square drive sockets and attachments is light in weight and fully inclosed to keep out dirt and grease; ⅜-in. lug makes it adaptable for use with all



⅜-in. square drive sockets and attachments. On other side of head is a ¼-in. square opening for use with ¼-in. adaptors or for use on small compressors, motors and shut-off valves. Made of chrome-vanadium steel, chromium plated and highly polished with round knurled handle which assures firm, comfortable grip.—**Bonney Forge & Tool Works, Allentown, Pa.**



SURFACING DRAG for use with 40- to 60-hp. tractor, is built for road-mix bituminous surfacing work especially in leveling, resurfacing and wedge courses. It consists of 24 ft. long framework having several staggered rows of free floating plows with strike-off blade in center of length. Will handle up to 120 lb. of stone or an average finished surface coat of 1¼ in. Elimination of segregation in mixing process, complete mixing in one pass and ability to iron out existent irregularities in old road surface are principal advantages. — **Littleford Bros., 443-457 E. Pearl St., Cincinnati, Ohio.**

Duff-Norton
LIFTING JACKS

The African Rhino may be renowned for his tough hide but Duff-Norton Jacks are noted for their brute, mechanical power and endurance. That's why you can depend on them to handle the toughest jobs with greatest ease whether the job calls for pushing or pulling, lifting or lowering.

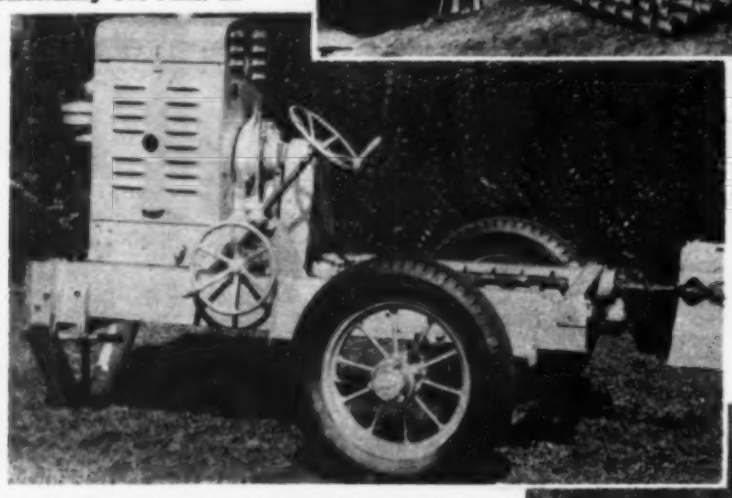
Used and preferred by safety-minded construction engineers the world over, Duff-Norton Jacks have established the highest standard of faultless performance—everywhere.

Ask your Mill or Mine Supply Dealer to supply you with *genuine* Duff-Norton Jacks —a type and size for every construction job requirement.

THE DUFF-NORTON MANUFACTURING CO.
Pittsburgh, Pa.

The House that Jacks Built

HORIZONTAL DRILLS provide quick and efficient method of installing service pipes and drains under streets, railroads, highways and buildings, without tearing up surfaces. Available in two models: "Senior" drill **(below, right).** 9 ft. long, weight, 1,500 lb., for heavy-duty service, is mounted on roller-bearing wheels for easy travel, and is designed for boring up to 12-in.-diameter holes for distances to 70 ft. Powered by 16-hp. motor giving drill speed of 165 r.p.m. Advanced and withdrawn by 12-in. diameter top wheel. Fitted with contracting brake on one shaft for safety in changing augers. "Junior" model **(at right and below, left),** length, 5 ft., weight 350 lb., drills 4½-in. holes up to 60 ft. in locations where quick work is essential to avoid traffic jams. Equipped with 7-hp. motor. Flexible shaft connection enables drill proper to be placed in hole as small as 2½x6 ft. **(right)** while power plant operates on surface. Installed and operated by two men. Both large and small units, designed by Allan Jay Parrish, well-known Illinois contractor, operate through flexible chuck which assures alignment and eliminates whip in augers. — **Paris Manufacturing Co., Paris, Ill.**



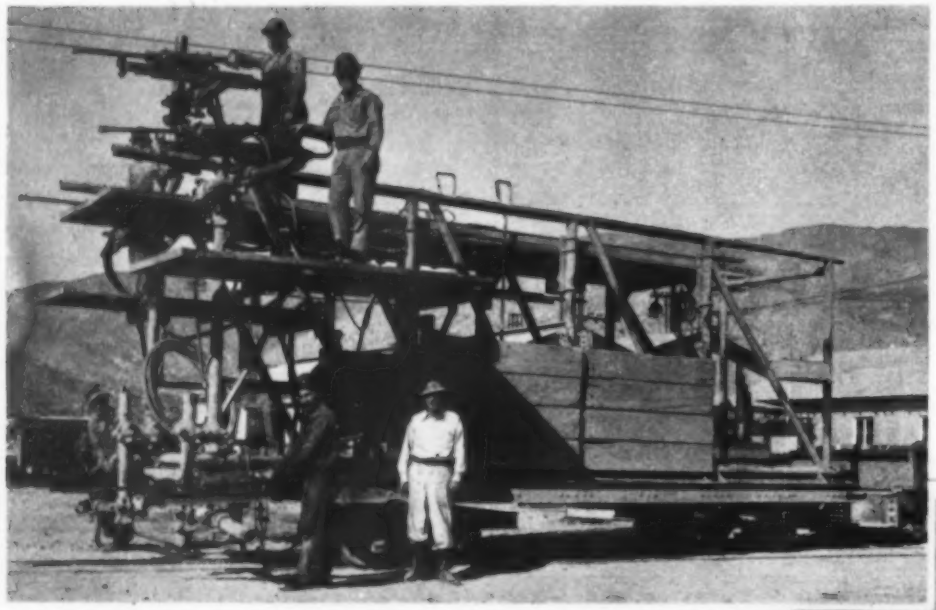
Further Information

Requests for further information should be sent to:

The Editor,
CONSTRUCTION
Methods and Equipment
330 West 42nd Street
New York, N. Y.

IMPROVED STEEL AND WOOD HANDLE (right) for Crystolon rubbing brick, affixed permanently at angle which permits concentrated pressure, is said to increase efficiency of tool, eliminating cramping grip and enabling concrete finishers to perform larger volume of work faster and with considerably less outlay of strength. Brick itself is of "fluted" type, diagonal slots giving fast-cutting shearing action and providing clearance to carry away waste material. These bricks are valuable on construction, remodeling and maintenance jobs for removing form marks, for smoothing concrete preparatory to waterproofing and painting and for conditioning plane surfaces of brick or stone. Size, 8x3½x1½ in.; weight, 3⅝ lb. — **Behr-Manning Corp., Troy, N. Y.**

GROUT GUN (below) fills holes made in concrete by spreader ties removed after completing job of holding formwork together. Has 2-in.-diameter barrel, 1 ft. long, 35 cu.in. volume, and grouts holes up to 1¾ in. in diameter. Loaded from either end depending on consistency of grout to be used. Rubber nozzle of gun is placed over spreader-tie hole and plunger forces grout under pressure into opening sealing it tightly. Workman on opposite side of wall checks flow of grout from open end of hole. With small rod or old hacksaw blade he loosens grout in case it fails to flow properly because of dry chunks in mix. Flexible nozzle adds to utility of gun as it can be held at almost any angle in grouting. — **The Clark Co., 3916 Tenth St., Des Moines, Iowa.**

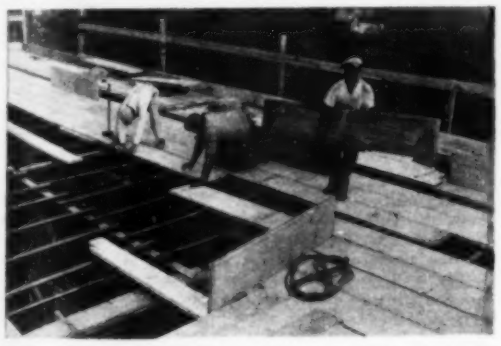


DRILL JUMBO, as used on Colorado River aqueduct Coachella tunnels, consists of portable mounting for six pneumatic feed drifters. Lowered to operating position and anchored to wall by three trunnion arms, each equipped at outer end with adjustable mining foot-piece. Pneumatic feed drifters then adjusted for drilling. When set of holes has been drilled Jumbo, is collapsed and hoisted out of shaft while operations of loading, shooting and mucking are performed. — **Worthington Pump and Machinery Corp., Harrison, N. J.**

SPRAYABLE CORROSION-RESISTANT PLASTIC MATERIAL called "Amercoat" is used for coating concrete, steel and wooden structures and prevents their destruction by corrosion, erosion electrolysis and other agencies. Dilute solutions of acids, caustics, gasoline, oils, greases, hydrogen sulphide gas and many other kinds of corrosive agencies are

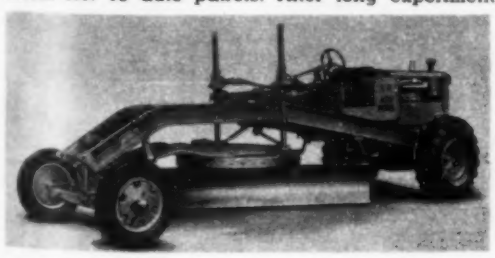
said to have no apparent effect on Amercoat within temperature range of from -50 to 150 deg. F. Bonds to base material, concrete, steel or wood, and cannot be peeled or chipped off. Vibration or limited bending will not check, break nor crack it. Normally applied to thickness of 1/64 in. but coating of any desired thickness from 1/100 to 1/16 in. may be sprayed on. Actually made up of three solutions, prime coat, enamel and seal coat which are applied continuously and are quick drying. Supplied in 1- and 5-gal. cans or in drums.—**American Concrete and Steel Pipe Co., Box 1428, Arcade Sta., Los Angeles, Calif.**

LIGHTWEIGHT CONCRETE PLANK. called Cantilite, designed for roofs and floors, is composed of cellular portland cement concrete and steel, factory molded to an absolutely smooth level surface on both faces. Plank is non-warpable, and is tongued and grooved on all edges, and is reinforced both top and bottom



with welded galvanized steel wire mesh. Nailable and cuttable, plank has no exposed metal. May be nailed to wood or laid and clipped on steel. Advantages: (1) Because of top and bottom steel reinforcement and tongue-and-groove structure it is possible to lay Cantilite regardless of spacing of supports; (2) smooth finish allows application of various stuck down floor finishes; (3) light weight decreases cost of supporting steel. All planks are reversible. May be laid regardless of weather. In stock lengths and two thicknesses 2 and 2¾ in. Weight, 2-in. plank, 12 lb. per square foot; 2¾-in. plank, 17 lb.—**Concrete Plank Co., Inc., 50 Sussex St., Jersey City, N. J.**

SINGLE LOW PRESSURE TIRES are now standard equipment on Caterpillar single drive No. 10 and diesel No. 10 auto patrols. After long experiment



to develop tire of proper size and to determine correct inflation for best performance, company states that these tires give area of ground contact almost double that of dual high pressure tires and, therefore, greatly increase traction—**Caterpillar Tractor Co., Peoria, Ill.**

The Safest Head Protection for Construction Men

The "Head Protector" Helmet

Made of "National" Vulcanized Fibre, molded into a seamless hat of great strength and unusual lightness. Withstands drop test of an eight pound ball, seven feet. Complete safety combined with extreme comfort.

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Also With 12' Flexible Handle

Perfect puddling of concrete with a VS-E1 on a breakwater job.

For paving, walls, breakwaters, locks, dams, buildings, tunnels, bridges, foundations and grade separations the VS-E1 JACKSON VIBRO-SPADE is speedy, economical, efficient, durable and dependable. 4" in diameter. Easily handled by one man. Write immediately for illustrated literature giving complete descriptions and specifications.

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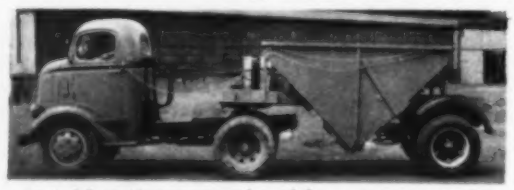
CONSTRUCTION EQUIPMENT NEWS... *Continued*

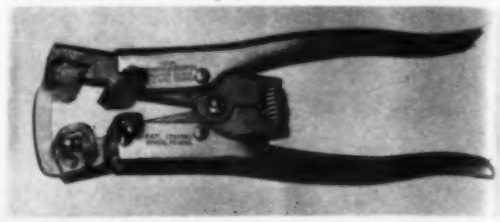
THREAD FORGING DEVICE for rethreading jackbit steels. Consists of set of blocks and die used in connection with Ingersoll-Rand sharpener to produce thread not only tougher and more resistant to drilling shock but also in quicker time than by other methods. Contractors estimate that 20 rods per hour can be rethreaded by this process. Installation shown was made during construction of new Storm King highway bypass in New York state, contractor, West Shore Concrete Co., Suffern, N. Y.—**Ingersoll-Rand Co., Phillipsburg, N. J.**

HOPPER TRAILER of 6- and 8-cu.yd. capacities is used with any kind of truck and is especially valuable for transporting and spreading stone, gravel, slag, cinders and like materials. Door extending full width of front side of hopper body can be opened



and held stationary or closed by operator manipulating side lever attached to double rope running to cab. Depth of spread is controlled by width of door opening and speed of tractor. Material does not scatter to side and spreads evenly. Reinforced and electric welded throughout.—**Hughes-Keenan Co., Mansfield, Ohio.**

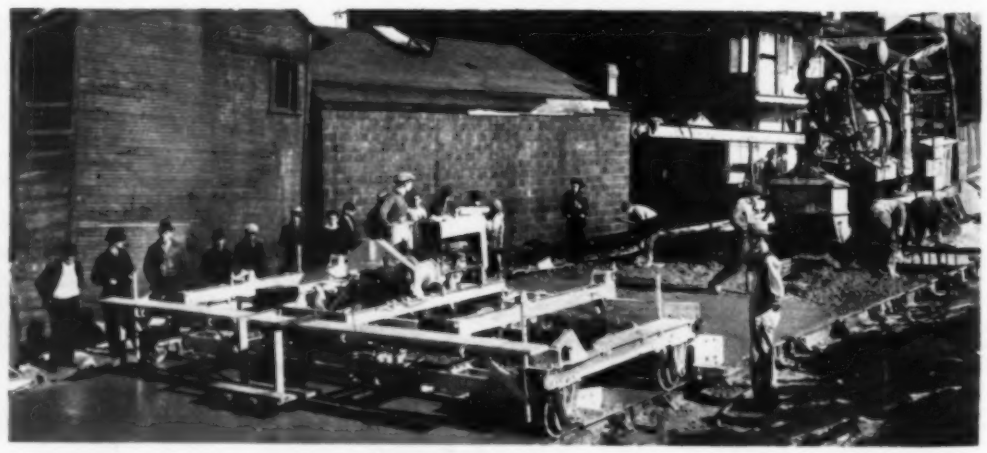
AUTOMATIC WIRE STRIPPER, designed particularly for stripping stranded wires, protects operator's hands and prevents nicking, cutting of strands and waste of wire. Clamps, cuts insulation and auto-



matically strips wire with one squeeze of handles. Provided with lever which stops return of arms until wire is removed after stripping. Then it snaps quickly back to normal. Is said to require no "cocking" and is always ready for use.—**Ideal Commutator Dresser Co., 4102 Park Ave., Sycamore, Ill.**

HIGH-SPEED CONCRETE VIBRATOR, electric motor driven, internal type for vibrating concrete into place as poured, consists of three pieces: an electric drive motor mounted on two small wheels, a variable length of flexible shafting and a vibrating unit which is immersed in concrete. Repulsion-induction type, single-phase, a.c. motor operating 110-220 volts has built-in gear box with molded gears that increase driving speed to 7,200 r.p.m. Metal-armored

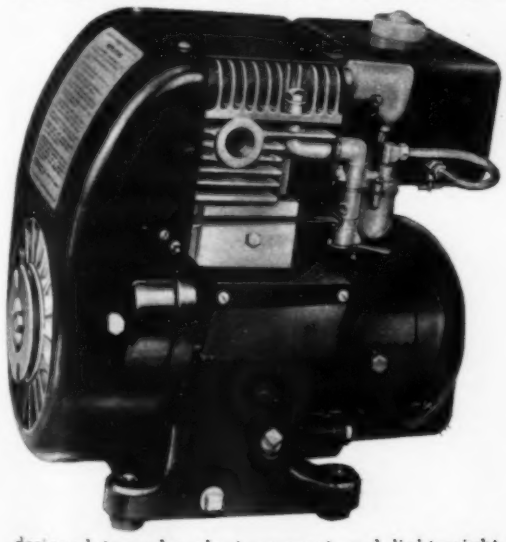
flexible shafts available in 7- and 12-ft. lengths can be coupled to make up to maximum length of 31 ft. Vibrating tool in two sizes, 1⅝ and 2⅝ in. in diameter, consists of steel cylinder, inside of which is out-of-balance shaft rotating at high speed in heavy ball bearings setting up vibration which permeates mass in all directions. Advantages: (1) Permits use of drier mixtures with corresponding increase in strength; (2) assures better bond between successive layers of concrete; (3) eliminates air pockets; (4) produces more waterproof, smoother finish concrete; (5) flows mass concrete into hard-to-get-at places; (6) eliminates hand spading and rodding and later patching and refinishing—**Syntron Co., Homer City, Pa.**



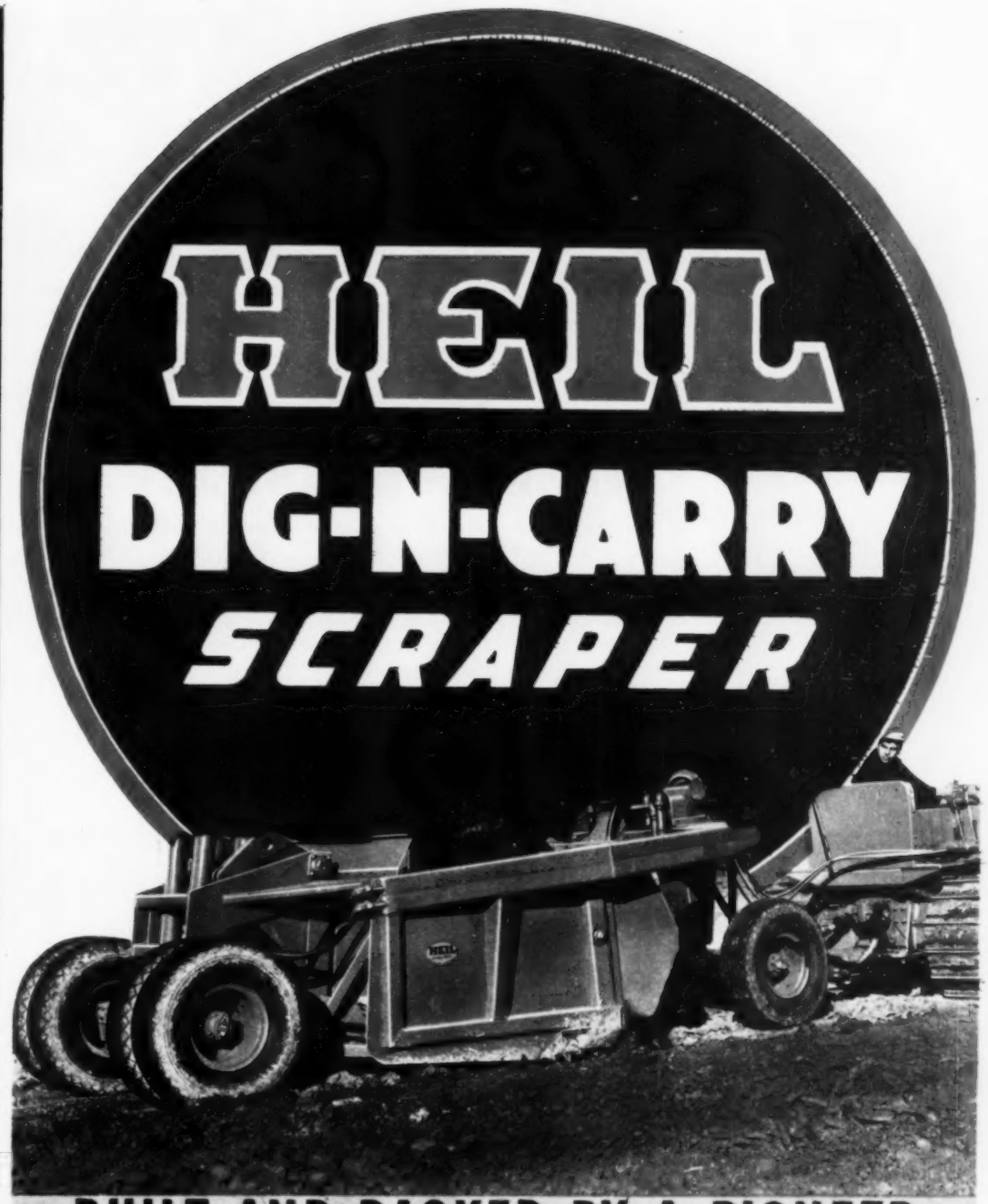
GAS-ELECTRIC CONCRETE PAVING FINISHER said to be able to strike off and surface finish 2,000 to 2,400 ft. of pavement per day in 18- or 20-ft. widths. Two rocking surfacers smooth concrete as machine travels slowly along road forms. Concrete placed by paver is leveled off by same method. Gasoline motor generates power for electric operating motors. Machine illustrated is in operation on 20-ft. concrete roadway laid down with new type 9-in. self-aligning road forms—**Blaw-Knox Co., Pittsburgh, Pa.**

WIRE TIE BUTTON for concrete forms is a one-piece malleable casting, weighing 4 oz., with a pair of lugs on the upper side forming a slot through which form wires pass and are stretched tight by turning up button with wrench. Under side of casting has short spike to hold it in position and ratchet teeth which sink into form studs or walers to prevent unwinding. Full tensile strength of wire is retained, as it is not weakened by twisting but is stretched straight. Any size wire up to No. 8 can be used. This form-tying device avoids use of double wales and requires only one button per tie. Simple process of tying forms consists of first driving spiked point of button into stud or waler and passing wires through slot formed by lugs. Second, ends of wires are bent, anticlockwise, half way round lugs. Third, wrench turns button clockwise until wires are tight. Fourth, nail is driven through hole in base of casting to prevent rotation; nail head is left projecting so that it can be pulled out easily when forms are to be removed. Form tie buttons can be re-used repeatedly. — **Neptune Mfg. Co., 117 East 23rd St., Los Angeles, Calif.**

GASOLINE ENGINE GENERATING SET, 5,000-watt, 110-v. a.c. electric generating unit, is said to be particularly suited for supplying electric current to places remote from usual sources or for emergency uses in homes, schools or public buildings. Outstanding feature: 90-deg. V-type, 4-cylinder engine,



designed to make plant compact and lightweight, operates at 1,800 r.p.m. and develops 15 hp. Well balanced and runs with minimum of vibration. Battery ignition with automotive-type distributor. Full force feed lubrication. Self-excited, forced fan-cooled type generator bolted to engine, armature being carried on ball bearings. Built in three different types: hand starting; remote control self-starting; full automatic. Furnished complete ready for operation. Overall width, 20 in.; height, 34 in.; length, 42 in. Weight, 575 lb. — **D. W. Onan & Sons, 43-51 Royalston Ave., Minneapolis, Minn.**



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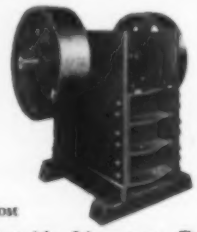

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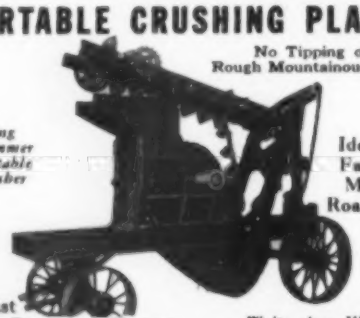

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Adjustable Crushing Range from 2½" down to Agricultural Dust.

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Here's a tool for you expert pipe wrench users who can't be fooled by shiny metal and ordinary guarantees — the new all-alloy RIDGID with new design, stronger housing and I-beam handle that adds still more strength to the famous unconditional guarantee.

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NEWS FROM MANUFACTURERS *About Their Products*

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

SAFETY RAILING — **Hunter Steel Co.,** Neville Island, Pittsburgh, Pa. (16 pp. loose-leaf, illustrated.) Describes patented safety railings in light- or heavy-duty sizes for use on bridges and bridge heads, ramps, curves along retaining walls, and overpasses. These railings are of structural steel with H-sections, channel or pressed plate posts and T-sections, deformed channel, angle or pressed plate longitudinal members which are connected through posts to form continuous members over entire length of railing. Designed to fit any type of architecture, allowing selection of distinctive posts, variety of ornamental handrails, different style buffers and individualistic, inexpensive skirts.

• • •

BRAIDED AND MOLDED HOSE — **Electric Hose & Rubber Co.,** Wilmington, Del. (64 pp., illustrated). Catalogs complete line of braided and molded hose. Data and helpful information is indexed according to purpose as well as kind. Loose-leaf form and pocket size contribute to convenience.

• • •

FORGED TOOLS — **Billings & Spencer Co.,** Hartford, Conn. (48 pp. illustrated, pocket size, 5x7-in.) Features new line of Vitalloy wrenches comprising line of double end engineers, double hex box wrenches, textile, construction and structural wrenches and shop tools. Also describes complete line of carbon wrenches for maintenance and shop work and chain pipe wrenches and vises for oil field workers.

• • •

PIPE UNIONS AND FITTINGS — **E. M. Dart Mfg. Co.,** Providence, R. I. (12 pp., illustrated). Complete data on types, sizes and prices with color illustrations showing distinctive, full-bearing, true ball-joint construction. In addition to tables giving dimensions, catalog describes precision operations, materials and methods of inspection used in manufacture of Dart Unions. Also illustrates processes of precision machining and oscillating — grinding the special two bronze seats; cutting accurate threads on tapping machines; testing finished unions with air under water.

• • •

FLEX-PLANE INSTALLATIONS — **Flexible Road Joint Machine Co.,** Warren, Ohio. Loose-leaf portfolio illustrating and describing Flex-Plane machines in use on various jobs throughout the country. Also contains shop illustrations and sketches which give reader clearer understanding of use of machine in efficient and economical manner. Machines and subjects discussed: (1) Concrete finishing machines for building roads 4 to 50 ft. wide; (2) Flex-Plane joint installers; (3) Black top finishing machines; (4) Black top and stone spreaders; (5) Dowel bar installers; (6) Expansion joint holders; (7) Asphaltic premoulded joint; (8) Mesh strike-off machines; (9) hand-screed strike-offs; (10) vibrators, internal and surface; (11) finishing tools.

• • •

ROCK DRILLS — **Ingersoll-Rand Co.,** Phillipsburg, N. J. (80 pp., illustrated.) Unusually complete tabulations of operating and physical characteristics for and blacksmith equipment, calyx and diamond drills and accessories. Eight pages are devoted to tabular matter on friction of air in pipes; horsepower drills and drilling tools, with installation and shop views of all the types of equipment presented, including drifters, stope hammers, wagon drills, jackhammers, paving breakers, jackbits, drill steel, sharpeners, furnaces required to compress given quantities of air to specified pressure and compressor capacities required to operate from 1 to 70 drills.

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Heavy Duty construction in Koehring Shovels means Heavy Duty service under the most severe operating conditions. Be certain of steady production when the digging is tough. Koehring Shovels are built to give that extra service which assures high yardage. Low maintenance cost and continuous operation assure job completion with a profit. When you have a tough digging job, investigate the Koehring.

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Faster Loading • • CUTS COSTS

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SOUTHWEST SCRAPERS HAVE PROVEN

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THAN OTHER
COMPETITIVE MAKES

Southwest Carry Type Scrapers Cut Earth-Moving Costs

Best proof of Southwest superiority comes from field tests where our Carry Type Scrapers are setting better earth-moving records. On tough jobs throughout the country users report, Southwest scrapers are loading faster and in less distance than other competitive makes. At Torrance, working in hard black adobe, the Southwest is cutting and loading to full capacity without the aid of a ripper.

Of course, this cost-cutting performance comes from years of experience in designing earth-moving equipment. The unit is sturdily constructed of alloy steel electrically welded by the "Lucas Process" of Arc Welding. The simple cable operating unit is fast, efficient, wear resisting.

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1 LOADED AND READY TO GO

2 A QUICK GET AWAY

3 HIGH GROUND CLEARANCE MAKES EASY HAULING

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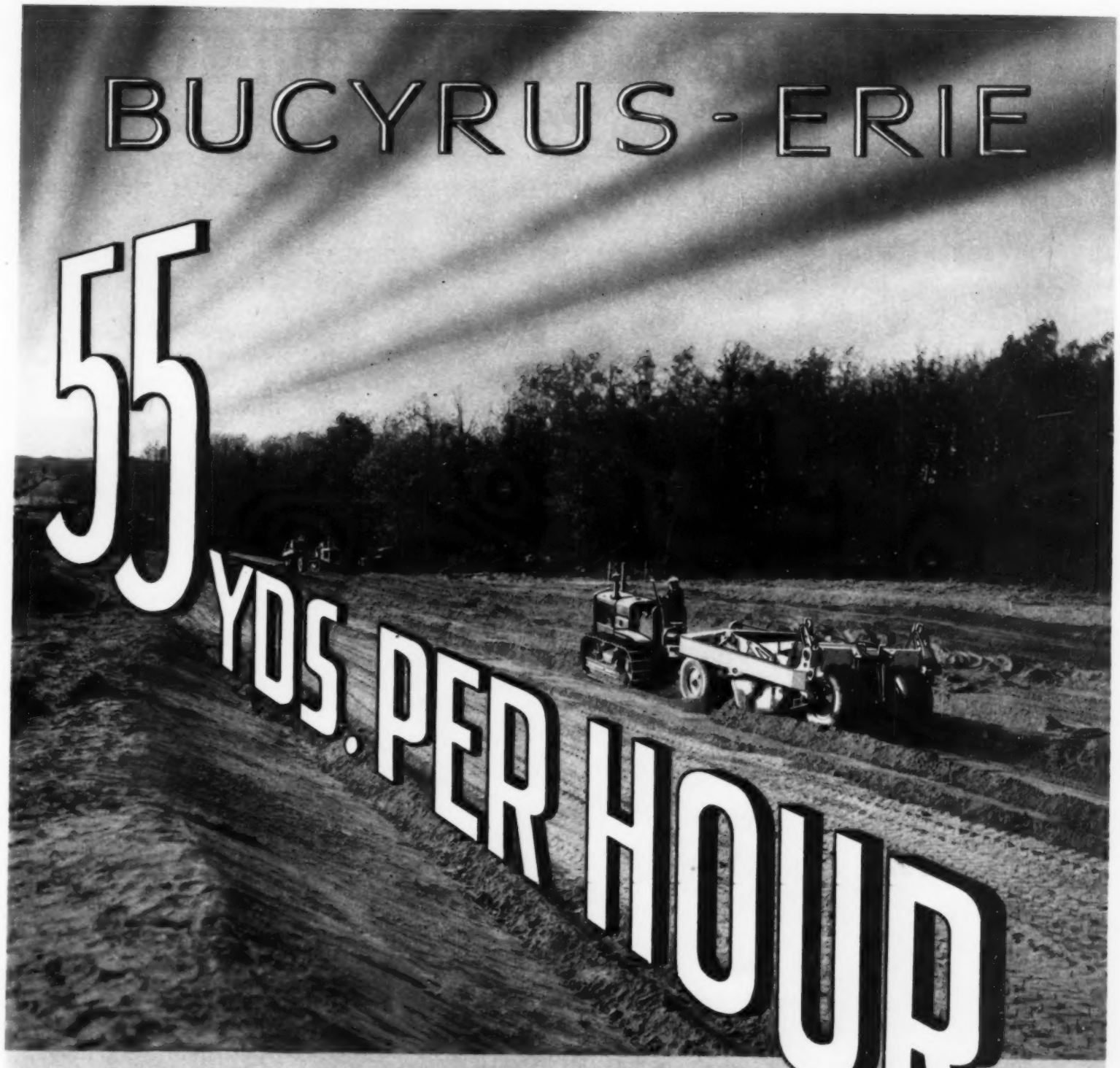
BUCYRUS-ERIE

55 YDS. PER HOUR



TWO BUCYRUS-ERIE 4-Wheel Scrapers, each powered by an International TD-40 TracTracTor, moved an average of 55 cubic yards of dirt per hour each on this Long Island roadbuilding job.

The haul ranged from 300 to 600 feet. The material was loose sand — difficult to handle. Loads averaged 4.2 yards of pay dirt (bank measure) in Scrapers rated at 4½-yards (struck measure).

Bucyrus-Erie Scrapers present a new principle in earth-moving for faster action, wider work range, and greater economy — the use of smaller units drawn by smaller tractors — working at higher speeds — and delivering more loads and more yards of pay dirt per dollar of cost.

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Excavating, Drilling, and Material Handling Equipment

FLEXIBLE ROAD JOINT MACHINE CO.

Mark This —

Only One "FLEX-PLANE" Finishing Machine required to build roads 9 to 15 feet inclusive — forward and backward screeding — screed 20" wide. Money cannot buy a better machine.

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BINS, STATIONARY
CEMENT BINS, PORTABLE
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CENTRAL MIXING PLANTS
BATCHERS (batch trucks), AUTOMATIC DIAL OR BEAM SCALES
BATCHERS (truck mixer) AUTOMATIC DIAL OR BEAM SCALES
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CONCRETE PIPE FORMS (hand method)
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SUBGRADE TESTERS (Scratch Template)
SUBGRADE PLANERS
TOOL BOXES
FINISHING TOOLS FOR CONCRETE ROADS (edgers, straight edges, etc.)
ONE MAN, BURLAP AND FLOAT BRIDGES FOR CONCRETE ROAD CONSTRUCTION

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO, U.S.A.

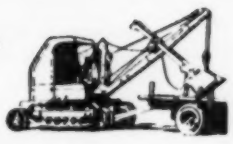
"Have *you* seen *it*?"

"...Sure have...it's better than ever!"

During 1937, more Byers Bearcat Jr. shovels and cranes were bought by contractors, gravel plant operators, towns and counties than in any previous year.

THE popularity of the Bearcat Jr., ⅜ yd. shovel is greater than ever before. How come?

First, because it does so many kinds of jobs at rock bottom costs that larger shovels can't match. Competition for work often is hand labor, not other larger power shovels. Therefore, the Bearcat Jr. naturally digs at lower cost per yard. This goes for grading jobs, basements, gravel pit work, cleaning ditches, cutting away banks, etc.



Moving costs also are lower with the handy, patented, two axle trailer which eliminates delays between jobs and widens the profitable traveling area of the shovel.

Second, because operating costs are low. For instance, the Bearcat Jr. digs all day on 10 gals. of gas. Other costs are proportionately low.

Third, because maintenance costs are low. The entire machine is ruggedly built. It is simple in construction. There are fewer parts and each is heavy. For instance, clutches and shafts are as large as on some half yard rigs.

Fourth, because this machine is dependable and keeps on working for a long, long time. For instance, the first Bearcat Jr. sold in 1932 is still operating for its original owner. Present models are much improved . . . up to the minute in features and basic design.

Fifth, because the purchase price is low. A smaller investment buys a Bearcat Jr., for cash or on time.

Sixth, because contractors who have Bearcat Jr. shovels have been able to make good money with them.

Seventh, because towns, townships, cities, counties, states, and federal bureaus have found they can get their work done faster with a Bearcat Jr. without digging so deeply into their budgets.

These are the reasons why the present popularity of Byers Bearcat Jr. is greater than ever before. It's why more are being bought now.

These are sound reasons why YOU should investigate the Bearcat Jr. Have you seen it at work? There's a Bearcat Jr. near you.

The 1938 model is greatly improved. It's better than ever. Why not look into it? For illustrated catalogs and brass tack job and data cost, write to

THE BYERS MACHINE COMPANY, Ravenna, Ohio

Distributors throughout the world

DISTRIBUTORS: SMITH BOOTH USHER CO., Los Angeles; THE EDWARD R. BACON CO., San Francisco; ANDREWS EQUIPMENT SERVICE, Portland; NEIL B. McGINNIS, Phoenix

BYERS

SHOVELS · CRANES · DRAGLINES · TRENCH HOES

THE SHOVEL THAT IS ALWAYS BUSY

INCREASED FRESH AIR MEANS DECREASED LABOR COSTS!

SMOKE AND DUST slow down work and run up costs. The way to speed up your tunnel-driving jobs is to make work easier by using "Ventube" ventilating duct. "Ventube" supplies plenty of fresh air to the most remote faces. Gets rid of smoke and dust in jig time. And saves you money by reducing man-hours.

What's more, it's cheaper to use flexible "Ventube." It goes up in a hurry. Sections secure in air-tight joints in a jiffy. And when blasting, the "Ventube" nearest the working face slides back quickly and easily.

When the tunnel is completed, you just take "Ventube" down, roll it up and carry it to the next job.

"Ventube" is made of extra-heavy, long-fibered Hessian cloth. It is highly resistant to acid water, fungus, damp and dry rot, gases and concussion, as it is *both coated and impregnated with rubber.*

Why not give "Ventube" a test on your toughest job? A single trial will convince you that "Ventube" gives you better ventilation at lower cost. Distributors are spotted for quick service.

DU PONT VENTUBE

THE FLEXIBLE VENTILATING DUCT

HERE'S A SHOCK-PROOF POWDER BAG!

It's safer to carry explosives in this du Pont SHOCK-PROOF powder bag because:

1. Every fiber in the sturdy material is impregnated with resistant rubber.

2. After impregnation, each side of the fabric is given several coats of rubber cement.

3. It will not conduct electricity.

4. It will last longer because the rubber coating *will not peel off.*

5. It is highly resistant to acid water, fungus, rot and powder fumes.

WRITE FOR COMPLETE INFORMATION ON SIZES AND CONSTRUCTION

E. I. DU PONT DE NEMOURS & CO., INC. *"Fabrikoid" Division, Fairfield, Conn.*

Southerly Sewage Disposal Plant, Cleveland, Ohio
General Contractor: John Gill & Sons Co., Cleveland
Piling Contractor: Johnson Foundation Co., Cleveland
Engineer: George B. Gascoigne, Cleveland

PILE DRIVING TREMORS *did not affect* QUICK SERVICE CONCRETE

To save time, and for efficiency of operation, concrete piling was poured with Lehigh Early Strength Cement. Here's the way it worked out:

Pile casings were driven each day until midafternoon, when the day's casings were filled. Overnight the concrete was strong enough to resist any damage from the terrific ground tremors that resulted on the resumption of casing driving the next morning. There was no back and forth laborious, costly moving of pile driver on the work—the quick service concrete permitted starting where work left off the night before.

In addition to two weeks saved in the pile operation, which was the objective, the contractor found the extreme plasticity of Lehigh Early Strength Cement facilitated the placing around reinforcing, avoided honeycombs, and resulted in excellent density.

Whenever speed will be profitable, use Lehigh Early Strength Cement. In 24 to 48 hours, under the same conditions, its strength compares with that of normal portland cement at seven days. This means—fewer forms through earlier removal and re-use, reduced construction costs through better co-ordination, reduced overhead through quicker completion. Consult the Lehigh Service Department on the use of Lehigh Early Strength Cement for any purpose.

LEHIGH PORTLAND CEMENT COMPANY

ALLENTOWN, PA. CHICAGO, ILL. SPOKANE, WASH.

Continentals Move the Earth!

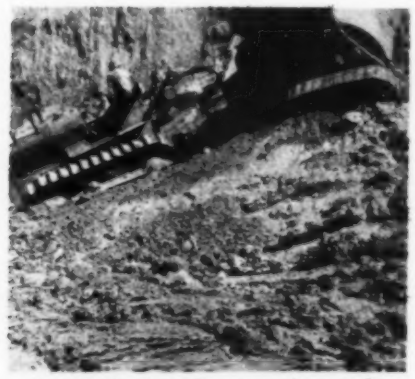
They move the earth faster at the lowest cost per yard for digging, loading and hauling. They dig anything the tractor can pull through — rocks, hard pan, imbedded roots, gumbo — in cuts from a foot thick down to wafer-thin.

Continentals dig and load as they haul, and have the exclusive feature of back-dumping like a truck. They dump clear of the wheels, providing quicker get-away. They backfill, windrow dump, pile, level and grade. They turn short and dump in close quarters, and do every job with a minimum of operator effort. Continental's fewer sheaves and cables eliminate trouble and wear, providing greater efficiency. They are lighter in weight, yet stronger per yard of capacity than other equipments.

Continentals are money-makers on every dirt moving job. Ask your Allis-Chalmers Dealer for operating data on the many projects on which they have cut dirt moving costs.

CONTINENTAL ROLL & STEEL FOUNDRY COMPANY
Tractor Equipment Division
14370 Railroad Avenue
East Chicago, Indiana

CAUGHT IN THE ACT!



A 5 yd. Continental on crawlers — for operation in wet or frozen dirt.

7 yarder backfilling on a highway job. Back-dumping as only Continentals can do it!

Come on in, the water's fine! A 10-yard cleaning out a glutted channel.

4 yd. Continental more than paying its way on an Illinois road relocation job.

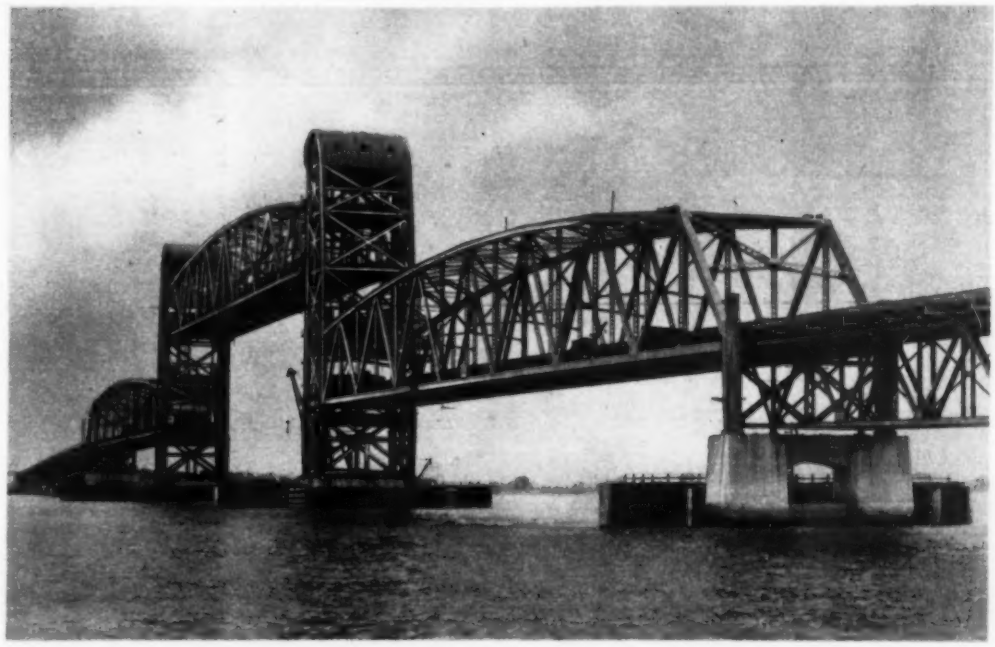
CONTINENTAL WAGON SCRAPERS

WEAR'S TOLL REDUCED

...when *NICKEL CAST IRONS* come on the job

(RIGHT)

New Marine Parkway Bridge, latest link in the express highway system which will eventually encircle greater New York City. Moving the heavy vertical lift-span up and down, places an unusually heavy burden on the differential cups and clutch cups. But the builder, American Bridge Company, amply provided for this by specifying Nickel cast iron for these parts, produced by the Youngstown Foundry & Machine Co. The high machinable hardness of Nickel cast iron plus its strength and density provide an unusually high degree of wear resistance.



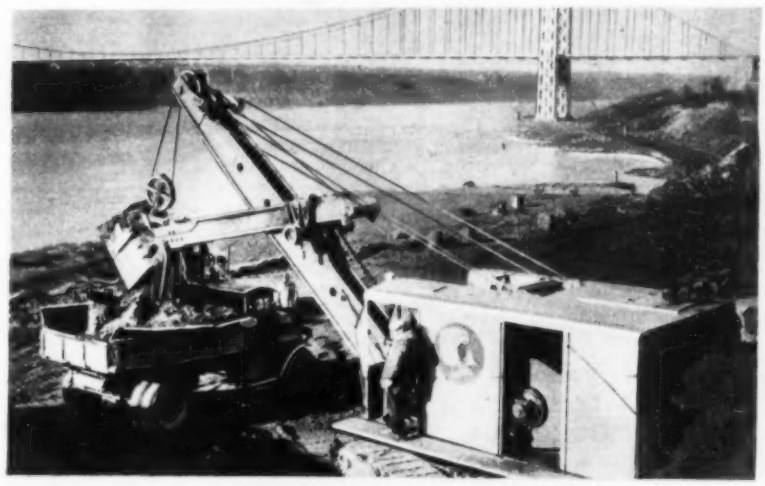
(LEFT)

Before and after—what happens to plain white cast iron impellers operating in pumps handling highly abrasive material consisting of 73% solid matter. Failure at the end of 551 hours was the average record of eight of these impellers. Yet, operating under identical service conditions, six NI-HARD* Nickel-chromium cast iron impellers demonstrated an average life of 1319 hours, a ratio of 2.4 to 1 in favor of NI-HARD. These results were obtained from records compiled at the Copper Cliff, Ontario, operations of The International Nickel Co., Inc.

(RIGHT)

Power shovels must take everything that comes their way. No machinery fights a more bruising battle, takes more shocks, stresses, wear. The Osgood Company of Marion, Ohio, long ago discovered that the way to beat the incessant wear encountered was to employ 1½% Nickel cast iron with a good base mixture for such parts as worm wheels, clutch shifter yokes, chain tighteners, clutch housings, boom hoist brakes and drums. The Osgood shovel pictured here is working on the Riverside Drive Project near the George Washington Bridge in New York City.

We invite consultation on the use of the Nickel cast irons and other alloys containing Nickel in your equipment.



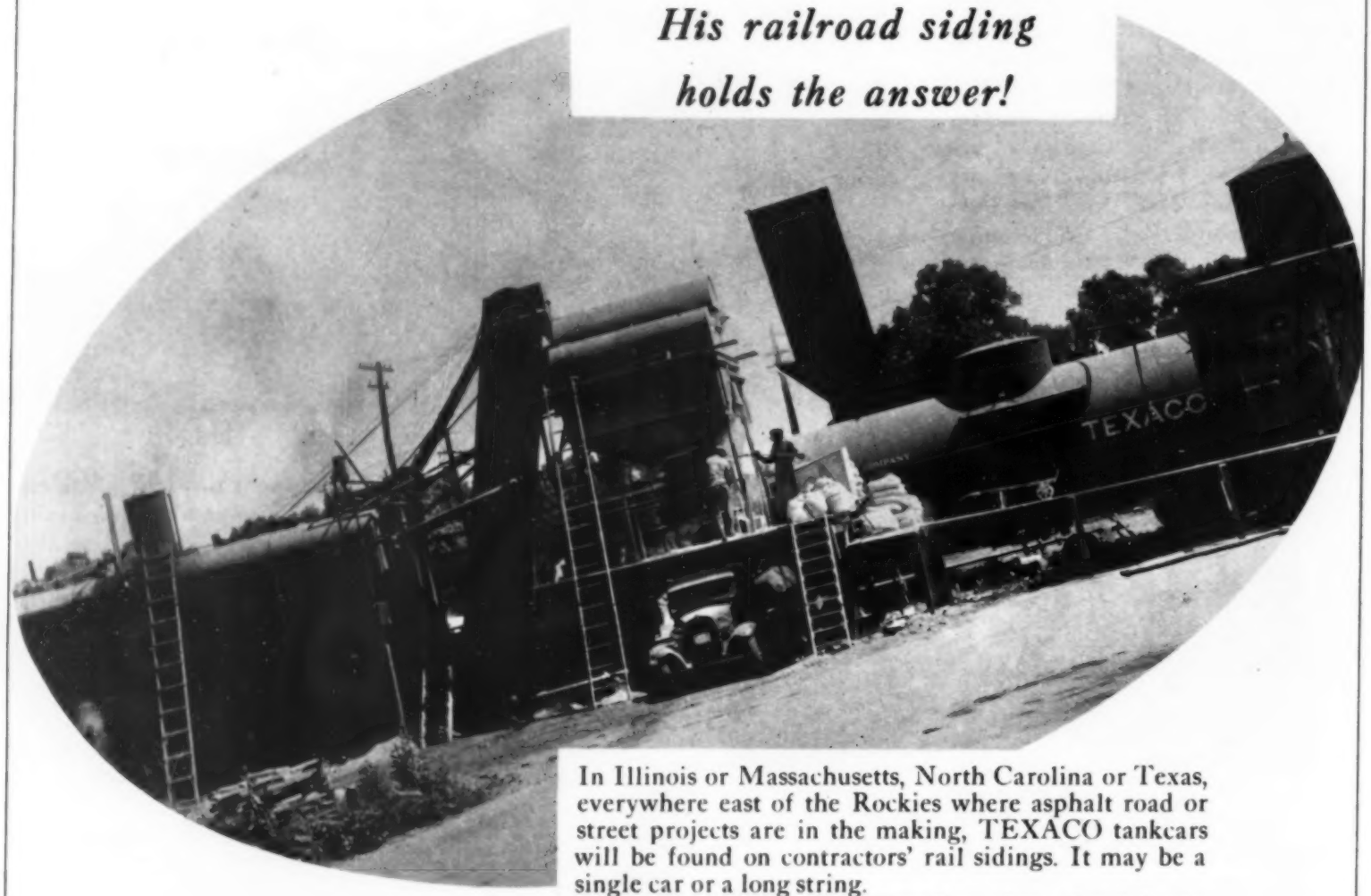
*Ni-Hard — Reg. U. S. Pat. Off. by The International Nickel Co., Inc. — Canadian Patent No. 281,986

NICKEL CAST IRON

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

WHAT ASPHALT FOR THIS ILLINOIS ROAD CONTRACTOR'S JOB?

His railroad siding holds the answer!



In Illinois or Massachusetts, North Carolina or Texas, everywhere east of the Rockies where asphalt road or street projects are in the making, TEXACO tankcars will be found on contractors' rail sidings. It may be a single car or a long string.

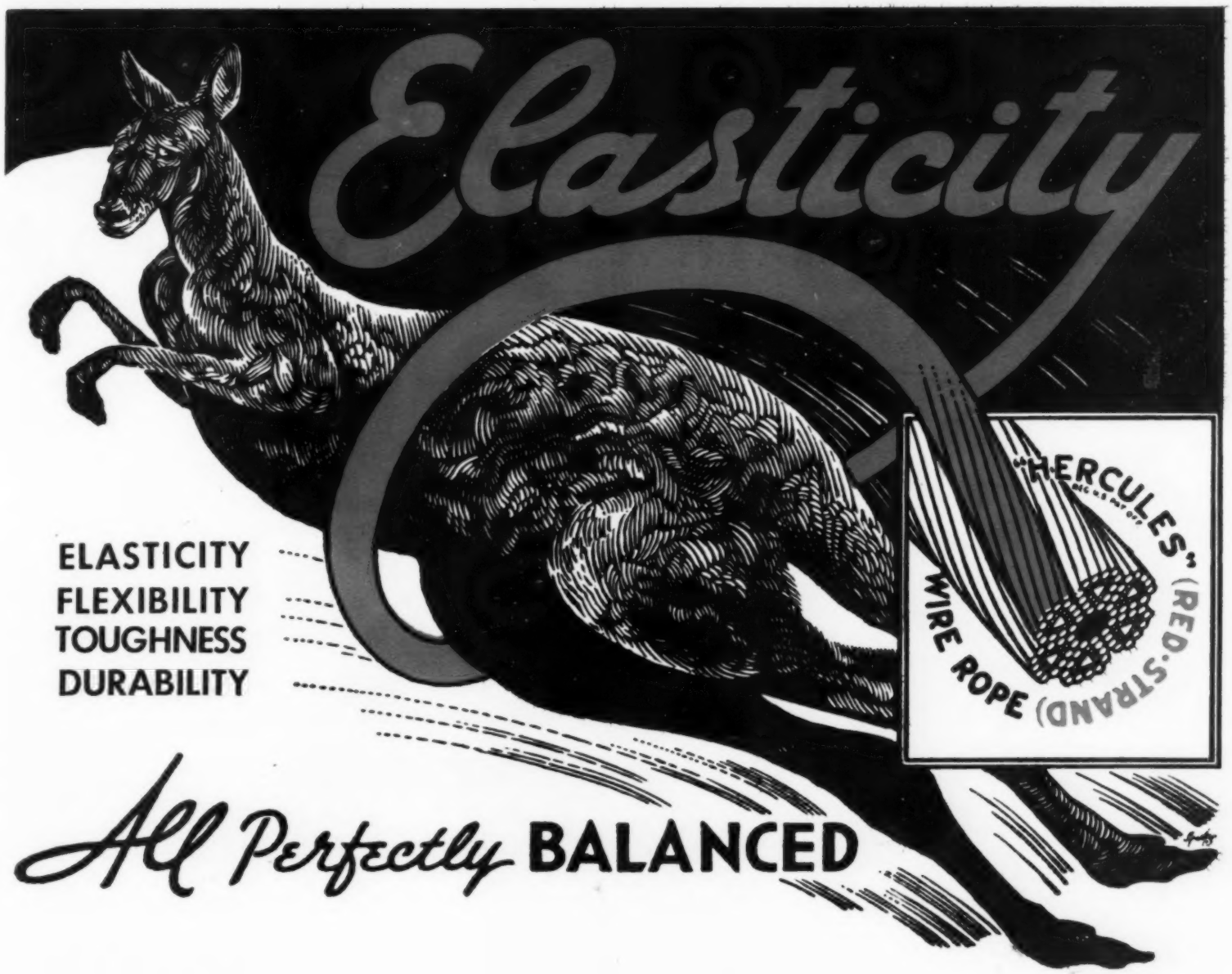
From carefully chosen locations along the Atlantic Ocean and the Gulf, as well as strategic inland points, TEXACO Asphalt can be shipped promptly and swiftly into every corner of the country between the Rockies and New England.

The thousands of tank cars of TEXACO Asphalt spotted on contractors' sidings annually are silent but convincing proof of universal contractor confidence in TEXACO quality and TEXACO service.

THE TEXAS COMPANY
Asphalt Sales Department
135 E. 42nd St., New York City

Chicago	Houston	Richmond
Cleveland	Dallas	Boston
Kansas City	Buffalo	Jacksonville
	Philadelphia	

TEXACO asphalt



There must be a certain amount of stretch in a wire rope. Otherwise sudden jerks would snap it. But overemphasis on elasticity, or any *single* property, destroys the balance and lowers the general efficiency.

Our eighty-one years of manufacturing experience have taught us how to build in "HERCULES" (Red-Strand) Wire Rope the elasticity to withstand the ever present jolts and jars. To preserve and cooperate with that elasticity we add strength . . . flexibility . . . toughness . . . and durability—all in proper balance, and all working together to make a powerful, dependable, long-lived wire rope that assures you economical performance.

You'll get more out of "HERCULES" (Red-Strand) Wire Rope because we put more into it . . .Why not try it on your next order?

For Maximum Efficiency in Preformed Wire Rope, Use . . .

PREFORMED
"HERCULES"
RED-STRAND
WIRE ROPE

Available in Both Round Strand and Flattened Strand Constructions

*Reg. U. S. Pat. Off.

MADE ONLY BY

A. Leschen & Sons Rope Co.

ESTABLISHED 1857

5909 Kennerly Avenue, St. Louis, Mo.

New York.....90 West Street
Chicago.....810 W. Washington Blvd.
Denver.....1554 Wazee Street
San Francisco.....520 Fourth Street
Portland.....914 N. W. 14th Avenue
Seattle.....2244 First Avenue South

THORNTON
FOUR-REAR-WHEEL DRIVE

2-2½ yd. batch—a practical load—quickly delivered. Load distribution protects front end.

Pick up material anywhere—deliver it anywhere. Eight traction treads driving.

Proper load distribution keeps front end on the ground when shovel operates.

One of the SENSATIONS of the ROAD SHOW

CHOOSE YOUR 1½- to 3-TON CHASSIS..have it

COMPETING for attention with huge road-building machinery, earth-moving equipment, big single-driving-axle trucks of large carrying capacity, the Thornton display was a beehive of activity, commanding the interest of contractors from every state in the union. There they learned about heavy-duty performance and downright tough jobs being accomplished by lighter trucks—Thornton-eered for traction. They asked the same questions you want answered—about TRACTION on four rear wheels; about EXTRA CAPACITIES; about SPEEDS and DOUBLE THE POWER to pull heavy loads; about FRAME REINFORCEMENT and BALANCED LOADS; about the COST of Thornton-equipped lighter trucks compared with big, single-driving-axle trucks of equal carrying capacity . . . Present Thornton users even brought their contractor friends to the Thornton display—proudly discussed their own successes with Thornton equipment . . . Before you buy ANY truck, get this story of Thornton performance and economy.

THORNTON TANDEM COMPANY
5153 Braden Street DETROIT, MICHIGAN

THORNTON-eered for TRACTION

Equally profitable - - stationary or portable

RELIANCE
CRUSHING PLANTS

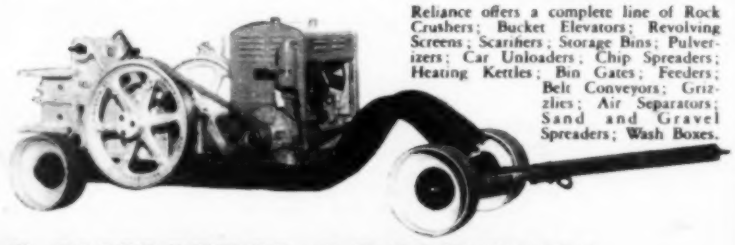
A Reliance Stationary Plant is a complete unit — rapidly set up, inexpensive to operate, insuring large capacity and very little vibration. Here is your crushing, elevating, washing and screening done at the spot, with materials stored in the famous Reliance Steel or Wood Bins (completely fabricated, easy to erect). Experienced contractors know that they can put these Reliance Units together quickly to meet any job capacity requirements — at a profit. You, too, will do well to investigate.

Right PORTABLE *with* V-BELT DRIVE

Whether you use this Reliance Portable Crusher alone or in combination with an Elevator, Chute Screen, etc., you can get no better value for your money in terms of capacity, low operating cost and rugged durability. The Reliance Crusher is famous for its strength and simplicity. It is particularly stable. A "swell" buy for crushing on any job. Send for detailed circular.

PRODUCTS

Reliance offers a complete line of Rock Crushers; Bucket Elevators; Revolving Screens; Scarifiers; Storage Bins; Pulverizers; Car Unloaders; Chip Spreaders; Heating Kettles; Bin Gates; Feeders; Belt Conveyors; Grizzlies; Air Separators; Sand and Gravel Spreaders; Wash Boxes.



UNIVERSAL ROAD MACHINERY COMPANY

NEW YORK OFFICE 114 LIBERTY ST.

Canadian Representatives:
F. H. Hopkins & Co., Ltd., 340 Canada Cement Co., Montreal, Que., Canada.

KINGSTON, N. Y., U. S. A.

DISTRIBUTORS IN ALL PRINCIPAL CITIES OF U. S. A.

PERFORMANCE

Bay City Model 65 — 1¼ yd. 20 Ton Crane owned by Owen-Ames-Kimball of Grand Rapids, Mich., lifting entire span of condemned Saginaw River Bridge.

BAY CITY SHOVELS

12 Sizes
⅜ to 1¼ Yard
Also truck mounted shovels and cranes

BAY CITY Shovels, Cranes and Draglines in 12 models ranging from ⅜ to 1¼ yards have always been noted for highest quality of workmanship, construction materials, design accessibility, speed, working range and safe load capacity.

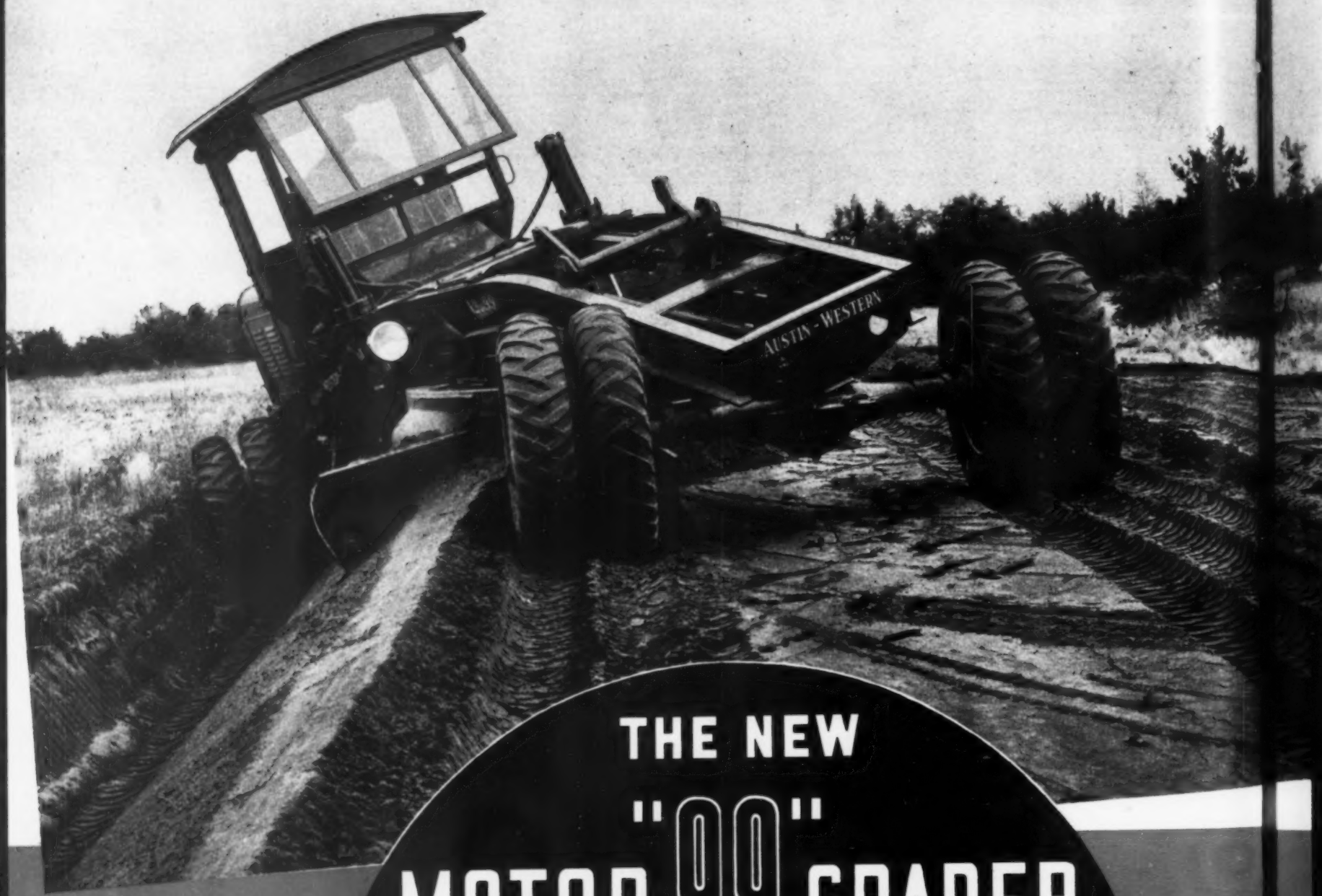
Yet when you buy a BAY CITY, you buy more than this — *you buy performance* which means more yardage at lower cost. The payoff is not the built-in features of a shovel but rather the ability of the shovel to produce under most exacting conditions. BAY CITYS have always paid big dividends as yardage producers.

If you want economical, efficient operation investigate BAY CITY shovels — write for descriptive literature.

BAY CITY SHOVELS Inc. (Cable Address "Dredge") **BAY CITY, MICH.**

BAY CITY SHOVELS

AMAZING PE



THE NEW

"99"

MOTOR 99 GRADER

DRIVES & STEERS ON

all 4 Wheels

THE AUSTIN • WESTERN ROAD M

ERFORMANCE

• IN SAND • AROUND SHARP CURVES • IN GUMBO • IN DEEP SNOW, *when the Going is Tough*

PERFORMANCE RECORDS demonstrate conclusively that the A-W "99" will outperform on any highway job . . . grading, ditching, oil mix, scarifying, bull-dozing, snow plowing, etc. *Proof* that soft going is no problem when a No. 99 is on the job . . . that it will do things beyond the capacity of any other motor grader . . . is piling up *in every section of the country.* Here are two typical examples:

On a southern road job . . . through "ball-bearing" sand where several different motor graders had failed . . . the No. 99 handled the entire mixing (sand with asphaltic oil) without faltering.

In widening a right of way flanked by scrub timber, the blade cut down 3-inch saplings without difficulty . . . 5 and 6-inch trees were pulled out by the roots, the "99" acting as a tractor. All-wheel drive and balanced weight made this time and money saving performance possible.

The revolutionary features which enable the A-W No. 99 Motor Grader to handle countless jobs better and cheaper are:

ALL-WHEEL DRIVE: With every ounce of weight on a driving wheel, the "99" develops MORE TRACTION and puts more available power to work. Rugged front drive, ALIVE WITH POWER, no longer acts as a drag. Front wheels climb up and over to exert a powerful pull on the blade.

CONTROLLED TRACTION: An exclusive feature whereby wheels and frame are offset to EFFECTIVELY NEUTRALIZE blade side draft. In this position a driving wheel tracks immediately in front of or behind each end of the blade to BALANCE the load.

ALL-WHEEL STEER: Front and rear wheels can be steered separately or together—in the same or opposite directions. This is extremely useful ON EVERY JOB as well as on sharp curves, narrow roads or wherever the work area is restricted. The "99" turns on a 30-ft. road, backing up only once. Wherever the "99" operates, turning and maneuvering time is greatly reduced.

The design of the "99" eliminates frame twist. Blade never leaves floor of road, even on 30 degree curves. There is no gouging at the toe . . . no wasting at the heel. Blade can be shifted under the heaviest load without dipping or tilting at either end. Quick-acting hydraulic controls . . . precision built and perfected by Austin-Western . . . provide smooth, positive and accurate adjustment under all conditions. Mail coupon for complete details on what the A-W "99" Motor Grader can do for you.

6 BASIC Performance-Improving Features

. . . enable the A-W "99" to exceed all previous standards of Motor Grader capacity, stamina and economical operation:

1. ALL-WHEEL DRIVE
2. ALL-WHEEL STEER
3. CONTROLLED TRACTION
4. STABILIZED FRAME
5. PRECISION SIDE SHIFT
6. FULL HYDRAULIC CONTROLS

AUSTIN-WESTERN

The Austin-Western Road Machinery Co.
1814 Barrows Street, Aurora, Illinois

Please send me your new "99" Motor Grader Catalog No. 1710.

Name .....

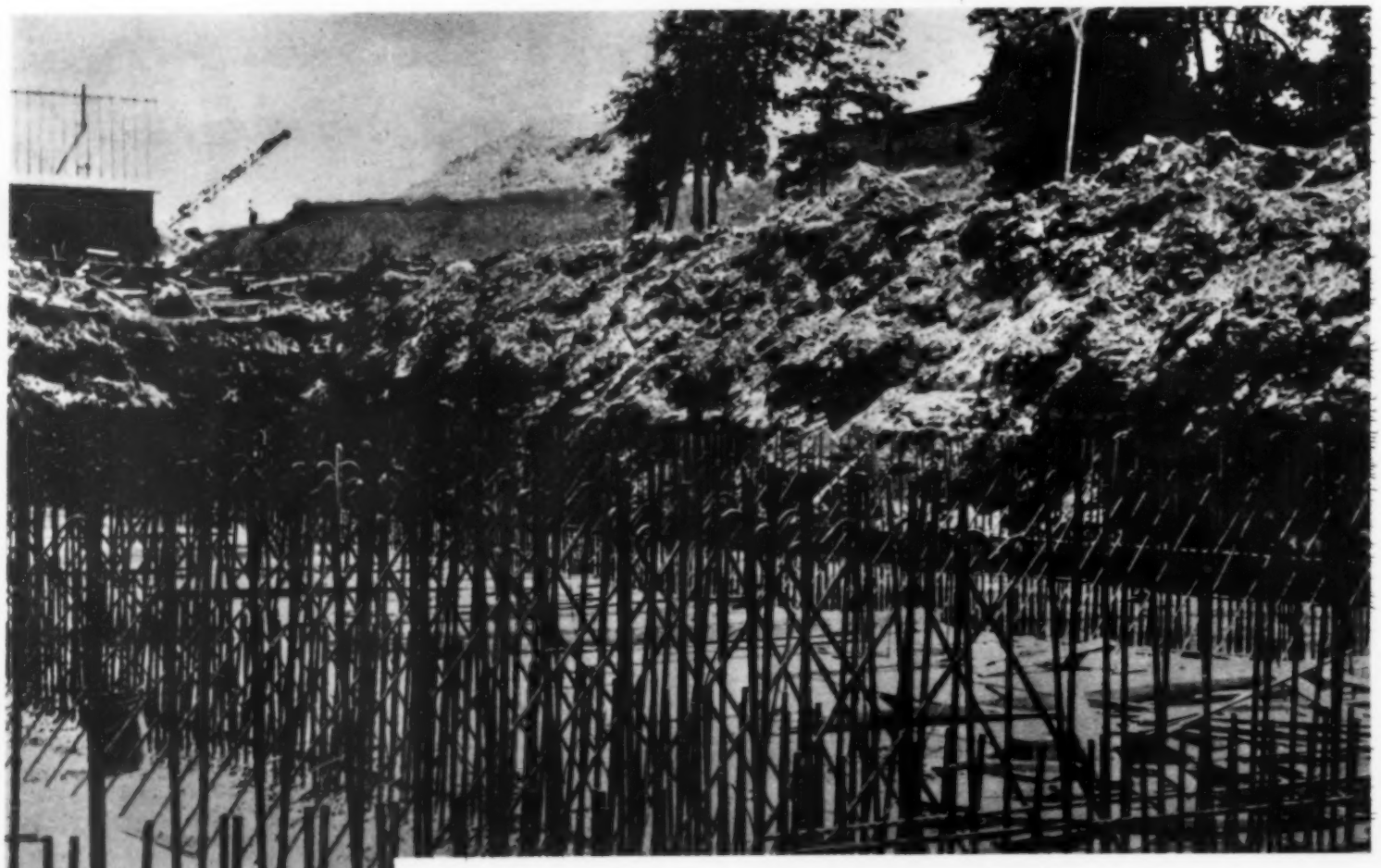
Address ..... State .....

City .....

99MG810

MACHINERY CO.

Specify U·S·S Concrete Bars



Be sure the Quality Symbol of the Concrete Reinforcing Steel Institute is on all Concrete Reinforcing Bars you buy.

...*get* QUALITY
PLUS PROMPT DELIVERY

U·S·S Concrete Reinforcing Bars are produced from finest raw materials by skilled workmen in modern, efficient plants. When you specify USS Concrete Reinforcing Bars you can be sure that a reliable product will be delivered to your job.

Prompt deliveries are important, too. For delay means loss of time and money, especially when your contract includes a penalty clause. Our wide distribution facilites are always prepared to deliver USS Reinforcing Bars to you when you need them, and we are equipped to cut and bend bars wherever facilities may be inadequate.

Every USS Concrete Reinforcing Bar bears the symbol of the Concrete Reinforcing Steel Institute. This symbol of quality is positive assurance to you that the bars which carry it are made to rigid specifications from new billet steel and are a product of domestic manufacture.

U·S·S CONCRETE REINFORCING BARS

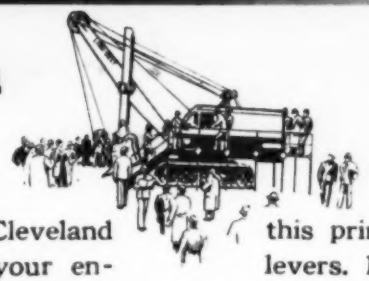
manufactured by

CARNEGIE-ILLINOIS STEEL CORPORATION · *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY · *San Francisco, California*
TENNESSEE COAL, IRON & RAILROAD COMPANY · *Birmingham, Ala.*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

The "Hit" Sensation of the Road Show!



Thank you — a thousand thanks to each and every one of you who visited our Speed-o-Matic Shovel exhibit at the Cleveland Road Show. It was thrilling to hear your enthusiastic praises — to see the crowds that gathered to inspect and learn about Speed-o-Matic Effortles Control. This was our first chance to exhibit the Speed-o-Matic since its introduction back in September, 1936, and we are proud to see the intense interest it created among the thousands of contractors and operators who stopped to look it over.

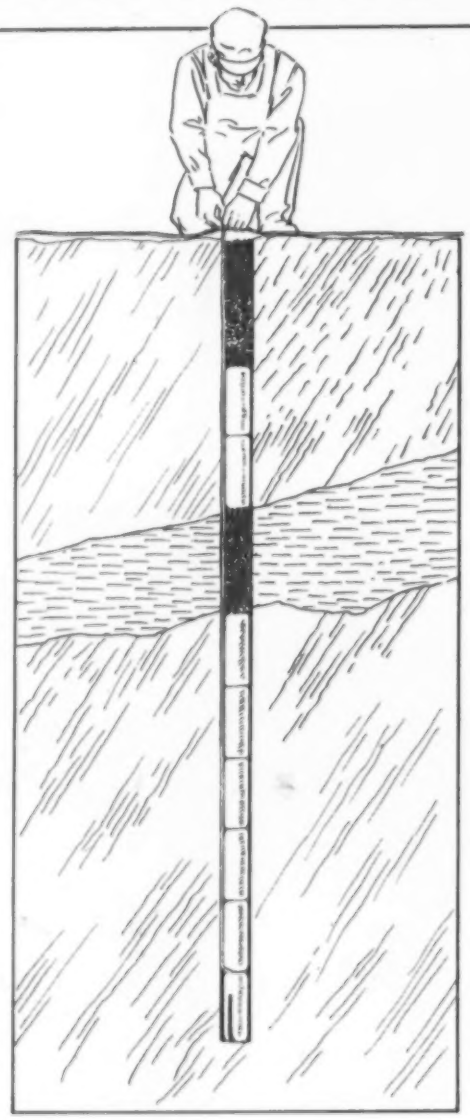
Those of you who got a chance to work the easy, short throw, control levers—saw for yourselves what an amazing advance this principle is over old-fashioned, back-breaking levers. Now, you know why Speed-o-Matic will "speed-up" any job—why it eliminates operator fatigue and shows cost savings that are nearly unbelievable. Some of you had the good luck to talk to a few of the Speed-o-Matic owners that were there and heard from their own lips how records are being broken on all types of jobs. We hope all your questions were answered completely — but if there's anything more you want to know, write us today!

Link-Belt Company, 300 W. Pershing Road, Chicago. Distributors and Offices in Principal Cities. 7295

LINK-BELT *Speed-o-Matic*

SHOVEL — DRAGLINE — CRANE

"DECKLOADS" are simpler with CORDEAU



EASY as filling your pipe — that's how simple it is to use Cordeau-Bickford Detonating Fuse in "deck loads." When the first cartridge has been lowered to the bottom of the hole, the Cordeau should be drawn closely against one side to protect it from injury. Then the rest of the cartridges and the tamping material can be set in place, the fuse making a direct contact with every cartridge and acting as an instantaneous detonator for each of the separate charges when the blast is fired.

This insensitive detonator is not only easy to use but also affords maximum effectiveness. Every cartridge has the added force of a primer cartridge, resulting in better fragmentation, quicker removal and other substantial economies.

CORDEAU·BICKFORD
Detonating Fuse

CB70

THE ENSIGN-BICKFORD COMPANY, SIMSBURY, CONN.

JUST PRESS THE BUTTON

FOR INSTANT AIR POWER

SCHRAMM 105 DeLuxe "Utility" Compressor. Insert showing instrument panel with gauges and starting button.

WINTER STARTING HAS ITS PROBLEMS! Think what it will mean to start your compressors as quickly, easily, safely as you do your automobile. Think of the time saved, the safety to workmen and the saving in wear on your compressor. SCHRAMM "Utility" Compressors give you built-in electric starting on every size and model. No extra cost. Just push the button — SCHRAMM "UTILITY" STARTS!

Write for SCHRAMM Bulletin 3700-CJ.
SCHRAMM INC., West Chester, Penna.

SCHRAMM
AIR COMPRESSORS

(Rex 160 Pumpcrete located 40 miles west of Little Rock, Arkansas, operated on a spillway job, by William Peterson, contractor)

WITH THE *Rex 160 Pumpcrete*

Chalk up another record for the new Rex 160 Pumpcrete! William Peterson, Arkansas contractor, rented this new low-cost pump to place 2500 cubic yards of concrete in this spillway job *at a very satisfactory figure for total placement cost!*

Using crushed creek gravel with 5.2 bags of cement per yard and 2½" slump, he pumped concrete into forms 600 ft. away, at an average rate of 16 cu. yds. per hour for daily yardages up to 125 cu. yds.

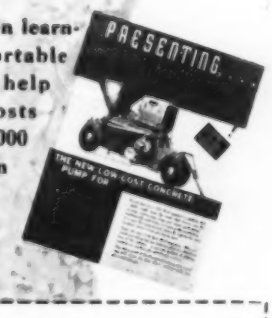
Is he sold? You bet he's sold on the idea of using the Rex 160 Pumpcrete for his small jobs. Who wouldn't be sold on a placement method that brings costs down low—that can be used on so many different types of jobs, including underpasses, overpasses, bridges, viaducts, culverts, foundations, etc.—that has been so thoroughly tried and proved by contractors all over the country?

CHAIN BELT COMPANY *OF MILWAUKEE*

PROCESS—GIESE • SYSTEM—KOOYMAN

REX PUMPCRETE

Send for this new free book Today!



If you are interested in learning how this new portable Rex Pumpcrete can help you cut placement costs on jobs of less than 5000 yds., use this coupon for your copy of "Presenting the Rex 160 Pumpcrete."

CHAIN BELT COMPANY,
1664 W. Bruce Street,
Milwaukee, Wisconsin.

Please send me my copy of "Presenting the Rex 160 Pumpcrete."

I am interested in buying ... renting ... a Rex 160 (check which).

Name (and title) .....

Company .....

Address .....

City ..... *State* .....

WHY RICHMOND TYING DEVICES

Aside from performance and dependability—RICHMOND Tying Devices for Concrete are better "buys" for the actual dollars and cents they save you.

Calculations in many varied types of construction jobs show that the use of RICHMOND SNAP-TYS and RICHMOND TYSCRUS brings down the tie cost of plain foundation work to an average of ¼c per square foot of form . . . brings down the cost of semi-heavy construction to an average of 20c per yard of concrete . . . brings down the cost of mass construction lower still.

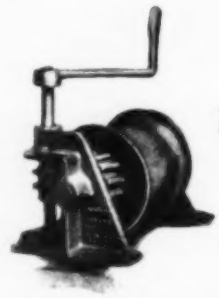
The reason? RICHMOND FORM-TIES are pre-fabricated—made especially for a given type of construction job, whatever it may be. Because they eliminate the necessity of selecting, hunting, measuring or cutting, they save time, labor, material, money. The advantages of RICHMOND FORM-TIES are yours to command, too. A note to us, outlining your problem, will bring the RICHMOND story in full.

RICHMOND SCREW ANCHOR CO., INC.

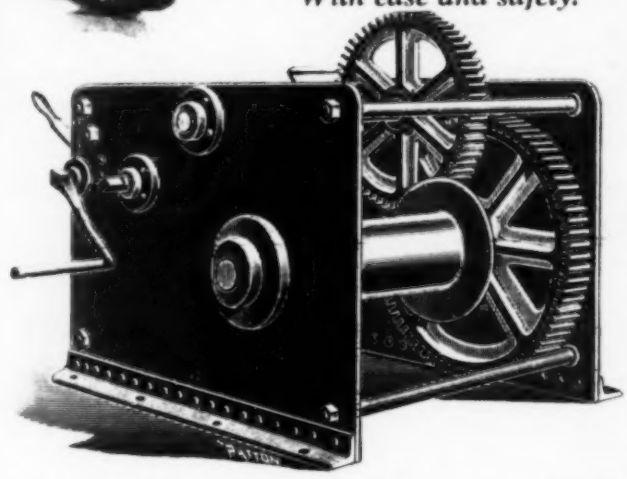
Tying Devices for Concrete

241-251 BUSH STREET
BROOKLYN, NEW YORK

DOBBIE WINCHES



A Dobbie Winch for every purpose.
From 100 pounds to 50,000 pounds capacity on a single line.
With ease and safety.



DOBBIE FOUNDRY & MACHINE CO.
Niagara Falls, N. Y.

Other Dobbie Products — Steel Derricks, Timber Derrick Fittings, Hand Winches, Motor Driven Winches, Blocks, Sheaves, etc.

MORETRENCH IN PERU

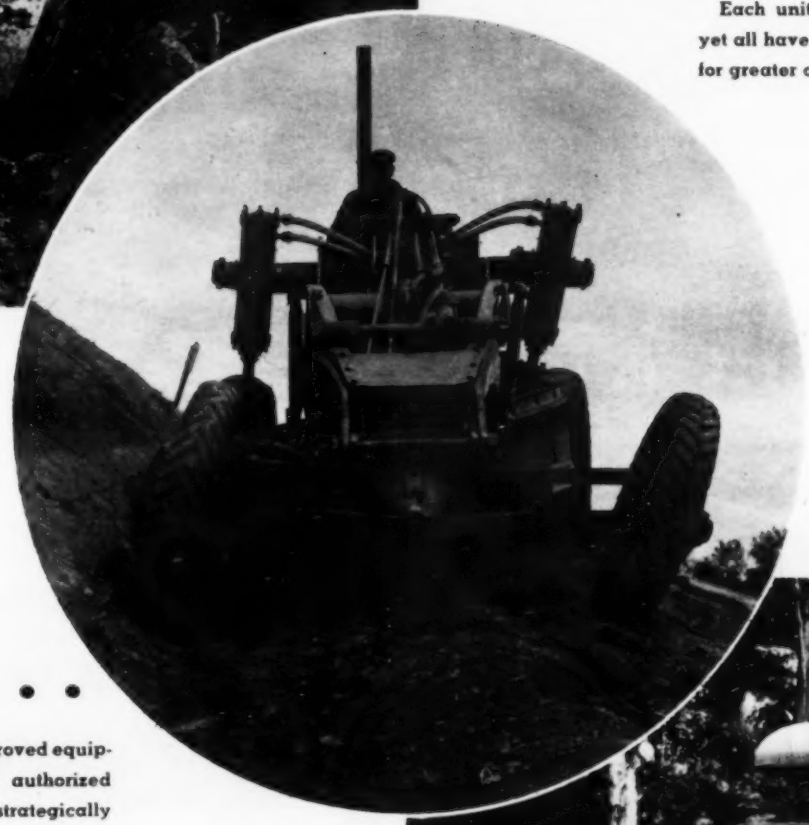
The Frederick Snare Corporation of New York and South America are the contractors for this huge Dry Dock in Callao. They had dry subgrades on their New York subway contracts and on bridge contracts elsewhere with the Moretrench Wellpoint System. The initial unit cost was higher, but past performances more than evened that up, and the Callao Dry Dock was no exception. The Moretrench Wellpoint with its one hundred per cent jetting tip is real profit insurance.

THERE ARE MANY REASONS

MORETRENCH CORPORATION

Sales and Rental Office:
90 West Street, New York

Plant:
Rockaway, New Jersey



What You May Expect In Equipment . . .

Invariably, one of the first questions asked when one takes his initial step as a home-builder is, "What things did you leave out that you would include if you were to build again?" Obviously, in almost every instance there would be changes to provide an added measure of living satisfaction.

What has that to do with road machinery, you ask. Just this . . . Galion took the initial step as a builder of road machinery over thirty years ago. Naturally during that time many changes have been made for the better and to guarantee the Galion line to a longer life expectancy. Galion knows the thrill of doing things well . . . of building soundly to serve well.

Today, the Galion line includes those many features and advantages which we overlooked originally. Today, Galion is your assurance of excellence in modern units to a good job of grading, spreading, leveling, mixing or rolling of material in road building and maintenance work.

Each unit is built to meet a specific need, yet all have those exclusive features that make for greater operating economy and satisfaction without your risking either failure or excessive cost.

We would like to tell you more about Galion road machinery and how it will do your job with less effort.

●

Pull type graders
Motor patrol graders
Maintainers
Rollers (3-wheel, tandem, portable, trench)
Rooters, Drags
Spreaders
Scrapers
Grader blades

In Service . . .

In addition to a complete line of improved equipment, Galion has more than fifty authorized and aggressive distributors located strategically throughout the United States. Besides, there are more than fifty sales agents located in almost as many different countries. A broad line . . . a broad service, with one object in mind . . . to serve you better.

These representatives know Galion road machinery . . . they are capable of giving intelligent, prompt and courteous response to your road building and maintenance needs. Call on the Galion distributor nearest you . . . he will convince you that you are not making new and strange decisions when you purchase Galion road machinery.

If you are a user of Galion equipment now, we count on the Galion performance record to bring us your future business. If you have not used our equipment we ask that you compare our designs and our service organization with any other manufacturer of road machinery, before you place your next order.

The Galion Iron Works & Mfg. Co.

Head Office & Works — Galion, Ohio

Export Division — Columbus, Ohio

INTERNATIONAL DISTRIBUTION

DRAG LINE ON WHEELS

Serving scattered jobs from scattered sources of supply called for this high-speed MICHIGAN TRUCK DRAGLINE, which has reduced unproductive time between locations, and is loading more trucks per day. Besides cutting operating costs, this MICHIGAN has increased operator efficiency by eliminating fatigue. . . MICHIGAN Accessory Equipment gives owners several machines in one- - DRAGLINE, SHOVEL, CRANE, CLAM and TRENCH-HOE- at minimum cost!

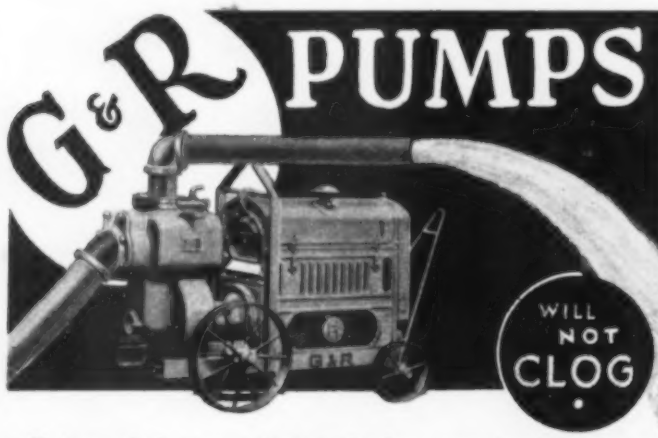
MAKE YOUR SMALL JOBS PAY AND YOUR BIG JOBS PAY MORE

25 MI. PER HOUR
FULL CIRCLE LOAD
TRUCK ECONOMY
AIR CONTROLS
CONVERTIBILITY

"Write for Bulletin "CM"

MICHIGAN POWER SHOVEL CO. Benton Harbor, Mich.

G & R PUMPS



Claims of fastest priming, highest suction lift, more gallons per minute, etc., *do not pump water.* On the job, the pump must do its own talking, and with dirty water, many a pump is inclined to stutter—and stop.

Let G & R Pumps tell you their own story on any job. They will deliver as much, and usually more, water *under any condition,* than any other pump. We will ship you one and let you be the judge.

Remember this about G & R Pumps — THEY WILL NOT CLOG — THEY ASK NO TIME OUT. Play safe! Try a G & R Self-priming Centrifugal before you buy any pump this year.

Distributors in 100 principal cities are ready to make prompt delivery of the G & R Pumps you need.

The Most DEPENDABLE Pump for The Least Money

THE GORMAN-RUPP CO. Mansfield, Ohio

PORTABLE
electric power and light
DELCO-LIGHT

On the Job . . . Where and When You Need It!

● For every contracting job where electric service is needed – choose Delco-Light. Easy to set up, move, operate. Turn on as required. Ideal for portable, stationary or stand-by requirements. New models operate at lowest costs in history.

Available in a wide range of sizes and capacities to suit your needs. AC or DC. Ask your local Delco-Light dealer for full details on these efficient power and light plants. No obligation.

This Model — 1500 watts—110 volts DC . . . starts and stops automatically as load demands. 2-cylinder 3 H. P. water-cooled engine. Other models available — 150 to 6000 watts — hand-operated batteryless, automatic or remote control types.

EASY PAYMENT TERMS

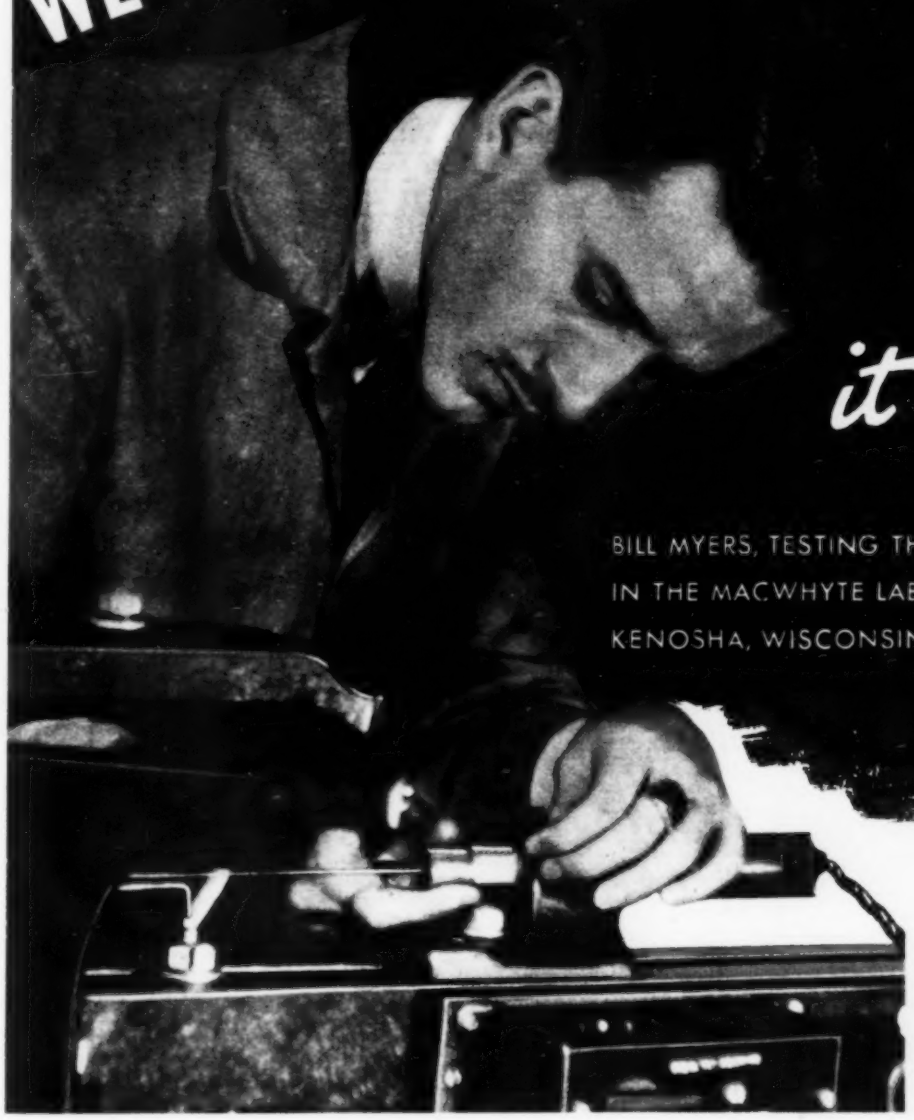
UNITED MOTORS SERVICE INC.
General Motor Building
Detroit, Michigan
Product of
General Motors

UNITED MOTORS SERVICE INC.
General Motors Bldg., Detroit, Michigan
Please send me complete information on Delco-Light Plants. CME-3

Name .....
Address .....
Town ..... *State* .....

WE PUNISH A WIRE TEN MILLION TIMES

..and still it won't BREAK



BILL MYERS, TESTING THE FATIGUE LIFE OF WIRE
IN THE MACWHYTE LABORATORY,
KENOSHA, WISCONSIN

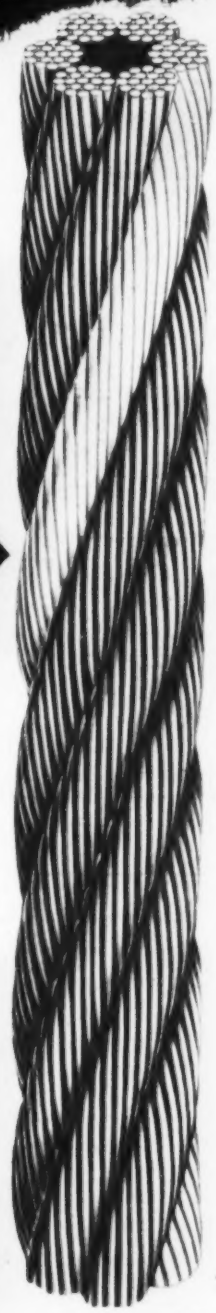
"That sounds like a lot of punishment," says Bill Myers—Macwhyte Metallurgist—"but this Haigh Robertson Fatigue Testing Machine actually rotates the wire, and through this rotation, subjects the wire to bending stresses. These bending stresses are repeated 10,000,000 times without failure of the wire. Then we're sure the wire will really resist fatigue on your job.

"Fatigue has always been one of wire rope's worst enemies. Every time a rope passes over pulleys, or twists, or when it's coiled on a drum, a condition of fatigue is set up. Fatigue can actually fracture some of the wires in a rope even when the breaking strength hasn't been reached.

"We've made a lot of progress in checking fatigue here at Macwhyte. By constant testing and experimenting we've found out how to make wire with the highest possible fatigue resisting properties. *That* means when you buy Whyte Strand PREformed, you get a wire rope that gives the best of service."

LOOK FOR THE
Whyte Strand
MACWHYTE
WHYTE STRAND
IS BETTER
BECAUSE IT'S MADE
BY SPECIALISTS

MACWHYTE COMPANY
KENOSHA, WISCONSIN
Manufacturers of wire rope and braided wire rope slings.
Distributors and stock throughout the U. S. A. for quick service.



MACWHYTE
Whyte Strand - PREformed
THE WIRE ROPE WITH THE INTERNAL LUBRICATION

These Buckeye MACHINES ARE EXACTLY WHAT YOU NEED FOR 1938 ROAD WORK PROFITS

Clipper
EXCAVATOR with METERED VACUUM CONTROL

Assures instant response through finger tip pressure, taking shovel operation out of manual labor field. Correct design. Rugged strength. For rough work or fine grading. A money maker for its owner.

Buckeye
SURFACE MATERIAL SPREADER FOR ACCURACY

Lays down exactly measured volume of material over every square yard of surface to be covered. Saves time, labor and material. Handles sand to 1 inch stone and spreads volume from a mere sprinkle to 60 pounds per square yard. Helps make those spreading jobs profitable.

HIGHWAY WIDENING MACHINE FOR SPEED

Digs trench of uniform width and depth, leaving subgrades undisturbed, true to grade, clean and ready to receive material. Digs at rate of mile or more per day.

BID THE **Buckeye** WAY

ask for our operation data before you bid

The BUCKEYE TRACTION DITCHER Company
FINDLAY, OHIO

THE BUCKEYE TRACTION DITCHER CO., FINDLAY, OHIO

Please send operation data and other information on the machine checked.

☐ SURFACE MATERIAL SPREADER
☐ HIGHWAY WIDENING MACHINE
☐ SEND A SALES ENGINEER
DATE 1938

CLIPPER EXCAVATOR
☐ MODEL 50—½ YD.
☐ MODEL 60—⅜ YD.
☐ MODEL 70—¾ YD.

☐ SHOVEL
☐ TRENCH HOE
☐ CRANE
☐ CLAM SHELL
☐ DRAGLINE

YOUR NAME .....
COMPANY NAME .....
CITY OR POST OFFICE ..... STATE .....

SPRING WASHERS

Spring washers and lock washers of every type and size, including the well-known Hipower and Kantlink types. There are thousands of more places where spring washers would improve the value of any product where bolts, nuts, cap or machine screws are used.

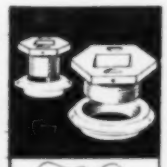
STEEL ROD ENDS

Drop forgings including steel rod ends of the adjustable yoke, plain yoke, and eye types. These articles in standard sizes and threads afford tremendous savings over special designs.

RETAINING RINGS

Spring retaining rings of special heat-treated spring steel are carried in many stock sizes—both open and closed types. Use of a spring retaining ring is an excellent manner of creating a shoulder on a shaft.

STEEL BARREL CLOSURES



Forged and machined fittings for steel barrels, drums, tanks and metal packages, including plugs, rings and flanges. Very rugged for use in transportation of alcohol, turpentine, oils and other expensive liquids.

CONTAINER HANDLES

Forged steel handles for heavy containers—can be rigidly welded, riveted or attached by a strap to lie flat when not in use. Rugged and most satisfactory for hard usage.

RHEOSTATS—RESISTORS—LOAD BOXES AND SPECIAL APPARATUS

Our electrical division—Hardwick, Hindle, Inc.—makes as fine electrical resistance products, fixed and variable, as can be devised.

Other products include windows for buses and railway cars, railway car window curtains, curtain rollers and fixtures, sash locks and lifts.

THE NATIONAL LOCK WASHER COMPANY
NEWARK, N.J.—EXPORT DIV., 15 E. 26 St., N.Y.C.

A New Portable **BITUMINOUS MIXING PLANT**

FOR MODERN ROADWORK

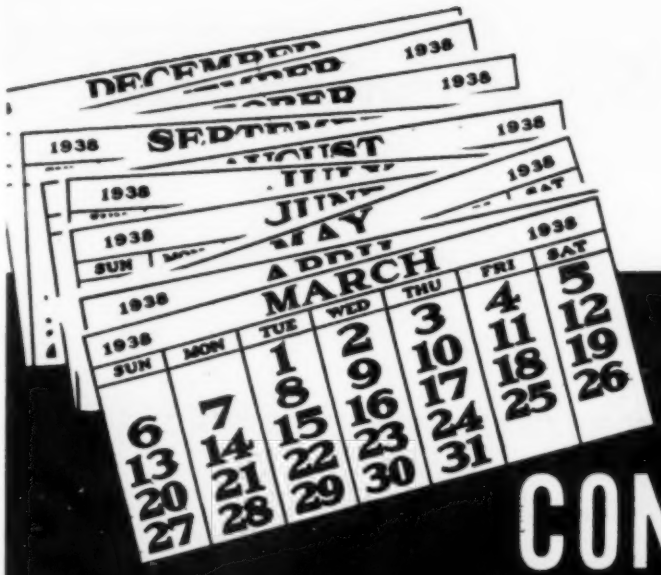
. . . at Low Cost

This plant was designed to meet the demand for the economical improvement of secondary roads. We have built several to date and they have proved their worth in actual service. No investment is needed for a running gear, plant adapted to standard flat bed truck and trailer hauling.

Some Details

- Can be erected by 3 or 4 men in a few days.
- No erection equipment required. Plant equipped with hoist and jib crane.
- Built in 2 units (dryer unit; and screening and mixing unit).
- Comply with most highway loading and clearance regulations.
- SKF bearings throughout. Fully enclosed vibrating screen. Steam-jacketed, steam-operated steel mixer. Large combustion chamber and dust collector.
- Write for Bulletin T-250.

HETHERINGTON & BERNER, INC.
701-745 Kentucky Avenue — Indianapolis, Ind.



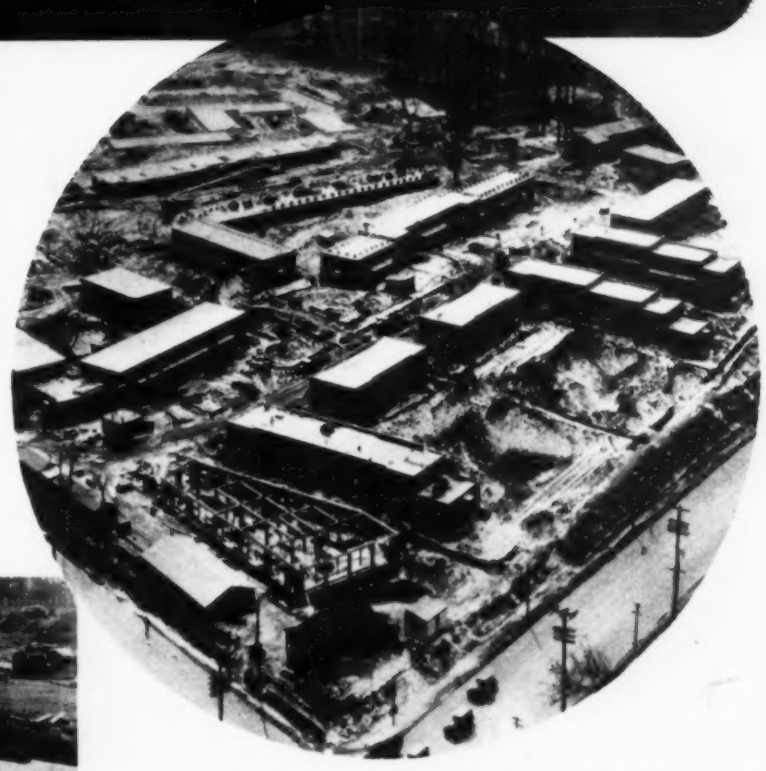
A TWELVE-MONTHS CONCRETING SEASON *Calls* FOR CALCIUM CHLORIDE

CONTRACTORS like the Turner Construction Company of New York, who constructed the Hill Creek Federal Housing Project at Philadelphia, find calcium chloride a valuable aid in getting their projects completed on time, without sacrifice of quality, regardless of weather conditions.

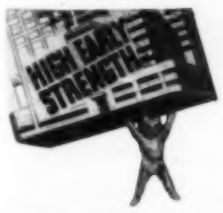
Concrete construction is no longer seasonal. The shut-down of concreting, once necessary as soon as cold weather, or spells of it, arrived has been eliminated through advanced construction methods—the use of heated aggregates, salamanders, covers and other protective measures. But the greatest single factor in facilitating year-round construction is the use of calcium chloride to accelerate the hardening of concrete and get it out of danger quickly.

The addition of calcium chloride, usually at the rate of 2 lbs. to each bag of cement, gives the concrete sufficient "opening strength" in half the time required for mixes not including calcium chloride. And the calcium chloride admixture also produces concrete of higher ultimate strength.

Delivery and placing of transit-mixed concrete at Hill Creek Housing Project.



Aerial view during construction of Hill Creek Federal Housing Project, Philadelphia, Penna.



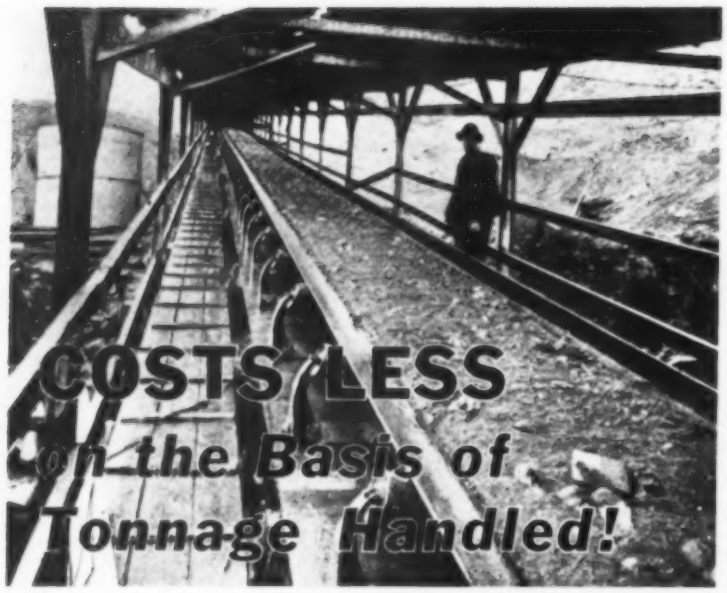
From skyscrapers to sidewalks, calcium chloride is needed for better concrete construction. If you have not already learned its value, look into the advantages of calcium chloride today.

Write to any Association member for full technical data, governmental reports, and practical information on simple methods of using calcium chloride in concrete.

CALCIUM CHLORIDE ASSOCIATION

The Columbia Alkali Corporation	Barberton, Ohio
The Dow Chemical Company	Midland, Michigan
Michigan Alkali Company . .	60 E. 42nd St., New York City
Solvay Sales Corporation . . .	40 Rector St., New York City

CALCIUM CHLORIDE
FOR MODERN CONCRETE CURING



GOODALL

"SSS" BRAND RUBBER CONVEYOR BELTING

Shut-downs due to replacements on permanent or temporary installations are reduced to a new minimum when GOODALL "SSS" Conveyor Belting is used. The cover stock is exceptionally strong and tough; the specially woven duck body combines longitudinal strength with proper flexibility; and the friction between the two eliminates all possibility of ply separation.

In the conveying of rock, crushed stone, ore, cement and other heavy or excessively abrasive materials, "SSS" Belting will be found to *cost less* on the basis of tonnage handled than belting of any other construction.

GOODALL MUCKER BELTS

These belts are really outstanding in their ability to withstand the brutal treatment this service imposes. Contractors say they're the *best buy*, from every standpoint!

Let us Quote on Your Requirements!

GOODALL RUBBER CO.

5 S. 36th STREET, PHILADELPHIA, PA.

New York • Chicago • Pittsburgh • Cleveland • Houston

FACTORY: TRENTON, N. J.

GOODALL MECHANICAL CORP.

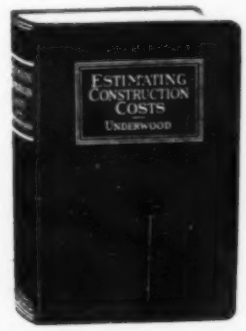
San Francisco • Los Angeles • Seattle

GOODALL — The originators of the "Standard of Quality" Line (Reg. U. S. Pat. Off.) of contractors rubber goods

98% *of your questions* answered *in these two books*

By G. UNDERWOOD
Construction Engineer

Estimating Construction Costs



630 pages, 6 x 9, 443 charts, 36 illustrations, flexible, $6.00

THIS book provides a simple chart system that gives construction costs at a glance and takes long and tedious headwork out of estimating. Over 400 of the charts are given in ready form for handy use, and cover the estimating of transportation, labor and material costs for all kinds of construction work. The book also presents a complete model estimate for a typical small building, together with a step-by-step description of the methods followed in making it.

CONTENTS: 1. Transportation of Materials. 2. Handling Materials. 3. Excavation. 4. Piling. 5. Concrete. 6. Wood Construction. 7. Brick, Tile and Stone. 8. Structural Steel. 9. Lathing and Plastering. 10. Roofing, Flashing and Waterproofing. 11. Pipework and Heating. 12. Plumbing. 13. Electrical. 14. Painting and Glazing. 15. Machinery and Machinery Erection. 16. Overhead. 17. Estimating. 18. Prices of Material.

Standard Construction Methods

SECOND EDITION
490 pages, 6 x 9, 422 illustrations, flexible Keratol, $5.00

HERE is a manual of actual construction methods — methods that are used every day by practical engineers, superintendents and others upon whom rests the responsibility of getting things done. It covers construction methods thoroughly — from first steps in organization and equipment to pipe work and painting — from excavation and pile driving to roofing and plastering.

CONTENTS: 1. Organization and Equipment. 2. Excavation. 3. Pile Driving. 4. Concrete Construction. 5. Wood Construction. 6. Brick and Stone Construction. 7. Steel Construction. 8. Roofing and Flashing. 9. Lathing and Plastering. 10. Scaffolds and Material Towers. 11. Erection and Rigging. 12. Pipework. 13. Painting. 14. Construction Schedules.

Examine either or both of these books for ten days free. Just send the coupon. Pay for or return the books after you see exactly what value they hold for you.

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Send me the books checked below for 10 days' examination on approval. In 10 days I will pay for the books, plus a few cents postage and delivery, or return them postpaid. (We pay postage on orders accompanied by remittance.)

☐ Underwood — Estimating Construction Costs, $6.00.
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(Books sent on approval in U. S. and Canada only.) CM&E-5-38

This BETTER CONTROL means BETTER ROADS

ADNUN Hydraulic Control is an asset to the Highway Engineer as well as the contractor. Adnun Hydraulic Control means better roads. Grouped together in one operating bank, control levers are within easy reach of the operator and their effortless operation permits meeting every condition almost at an instant's notice.

Power cut-off gates in the hopper are in four sections, each section independently controlled. End gates are lifted hydraulically for the delivery of material to curb or shoulder. The screed with its overlapping action is lifted at a touch of the lever for super-elevation. The operator is free to watch his work!

In addition, you have all the old proved Adnun advantages—the quick lift, continuous course correction. Adjustable screed speed and the heavy duty dependable construction that assures long, trouble-free service.

Don't figure on a Black Top Contract without getting complete details on the new Adnun.

FOOTE COMPANY, INC.
Nunda New York

ADNUN
TRADE MARK REGISTERED

BLACK TOP PAVER
with Hydraulic Controls

•

MULTIFOOTE CONCRETE PAVERS
ADNUN FINISH SPREADER

BAKER PRODUCTS THAT SAVE TIME AND MONEY··

You start saving when you get your first Baker Direct Lift Bulldozer — saving in time because of fewer delays. No slowing up for the tougher assignments. Simple compact construction with few wearing parts and less repairs gives you a smoother-running job.

The new Model 180 5-yard Hydraulic Scraper is rapidly finding its place in contractor's equipment. It's light (nickel-copper alloy steel) but strong enough to handle your hard jobs with a 40-50 H.P. tractor. Dumps cleanly from the rear — spreads as it dumps.

The Model 206 Baker Bulldozer shown here on an Allis-Chalmers Model K Tractor is leveling a grade near the famous Bahai Temple at Wilmette, Ill. Doetsch Bros. Contractors, Evanston, Ill.

TRACTOR SCRAPERS

Here is a Model 180 Baker Hydraulic Scraper dumping its load cleanly and spreading it evenly as it dumps. It can be backed up and dumped over the edge of a fill or at bridge abutments.

Write for Special Bulletin On Any Baker Product

HYDRAULIC BULLDOZERS

BAKER

TRACTOR EQUIPMENT

BULLDOZERS, GRADEBUILDERS, ROAD ROOTERS, SCRAPERS, ROAD DISCS, ROAD MAINTAINERS, SNOW PLOWS

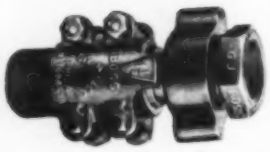
THE BAKER MFG. CO. • 568 Stanford Av., Springfield, Ill.

BETTER PERFORMANCE LONGER SERVICE ON ANY JOB

"DIXON" AIR HAMMER COUPLINGS

Designed and built to withstand the continual vibration of hand hammers and rock drills, this Dixon coupling has a longer, consistently economical service life on the toughest job. And, like the "Boss," it is rust-proofed by Cadmium Plating.

"BOSS" HOSE COUPLINGS



Used for steam hose, steam hammers, air, hydraulic or road builders' hose . . . "Boss" Couplings have no equal for dependability in service. Parts are of steel or malleable iron to withstand abuse . . . Cadmium Plated for rust proofing.

Furnished in Washer or Ground Joint Type.

DIXON

VALVE & COUPLING CO.

LOS ANGELES PHILADELPHIA HOUSTON

Carried in Stock by Leading Rubber Manufacturers and Jobbers.

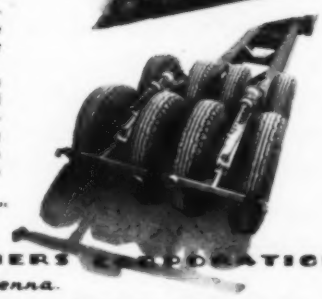
with the NEW Advanced Equalizing Air or Vacuum Brakes

Rogers Trailers for 1938 . . . embodying well proven, fundamental features of Rogers design . . . engineered from tip to tail . . . completely electric welded . . . electric steel castings throughout . . . mounted on pneumatic tires . . . equipped with an original system of equalizing brakes.

These features combine to give a stronger but lighter trailer that hauls more easily at lower cost . . . that is under absolute control at all times regardless of road or load conditions.

There are types and sizes of Rogers Trailers for all needs reflecting essential knowledge gained by years of specialization. Write for the latest Rogers catalog . . . describing these latest developments of the pioneer trail builders . . . plus the new braking system.

"Experience Built It—Performance Sold It."



ROGERS BROTHERS CORPORATION

220 Orchard St. *Albion, Penna.*

Builders of LOW BED *and* GIRDER TYPE HEAVY DUTY TRAILERS *Exclusively*

It's Easier

to get a Good Job with ARMCO Pipe

1 No special equipment except ropes and plank skids is needed to lower the pipe into the trench.

2 It's easy to place each section with the smooth bituminous pavement squarely in the bottom.

3 Strong, tight joints are made quickly and simply with the Armco bolted connecting band.

Engineers and contractors everywhere praise Asbestos Bonded Armco Pipe because it's so easy to handle and install. No heavy machinery is needed. And there's no danger of the pipe chipping, breaking or injuring workmen.

These features naturally mean quicker, easier installation. And since Asbestos Bonded Armco Pipe can be specified in 20 foot lengths, you save up to 1056 joints per mile. That's why Armco pipe costs only one-fourth to one-tenth as much as rigid pipe to lay, line and join. Because of its great strength, flexibility and sturdy joint connections, Armco pipe also requires less excavation, less care in preparing the foundation.

Vote for these features on all your drainage and sewer jobs and you'll save time, money and grief. What's more, by using Asbestos Bonded Armco pipe you'll gain increased permanence. Armco Culvert Mfrs. Association, Middletown, Ohio.

ARMCO

Asbestos Bonded

ARMCO PAVED INVERT PIPE

THIS FREE BOOKLET

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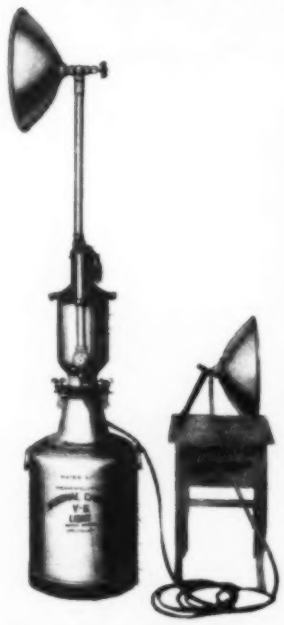

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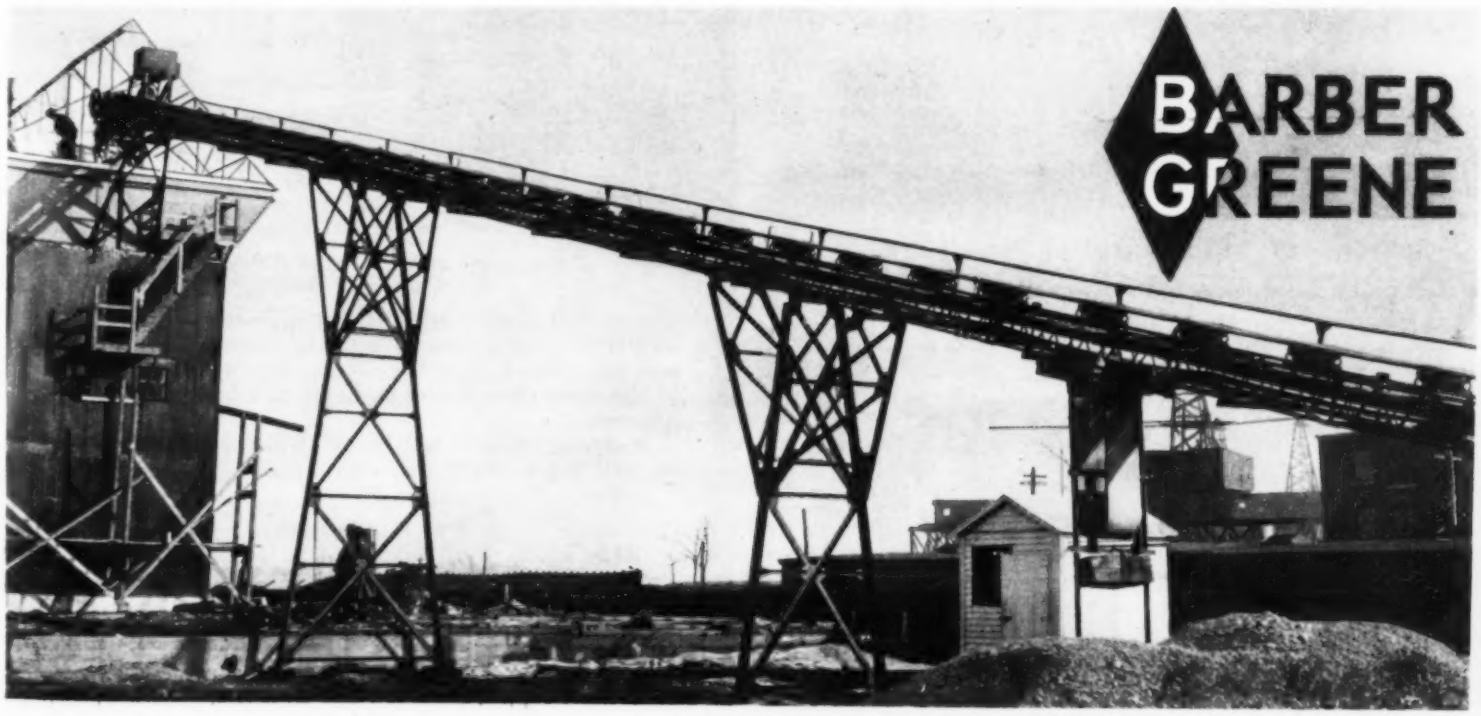

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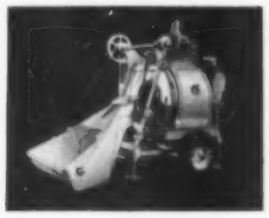

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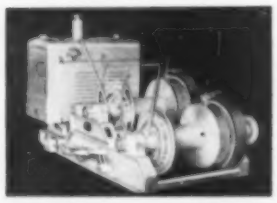

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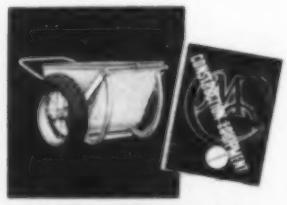

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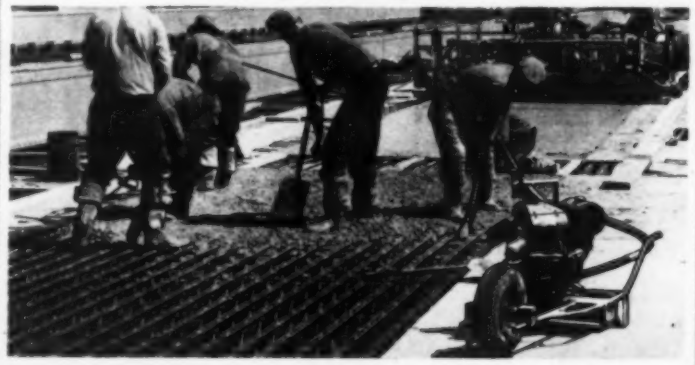

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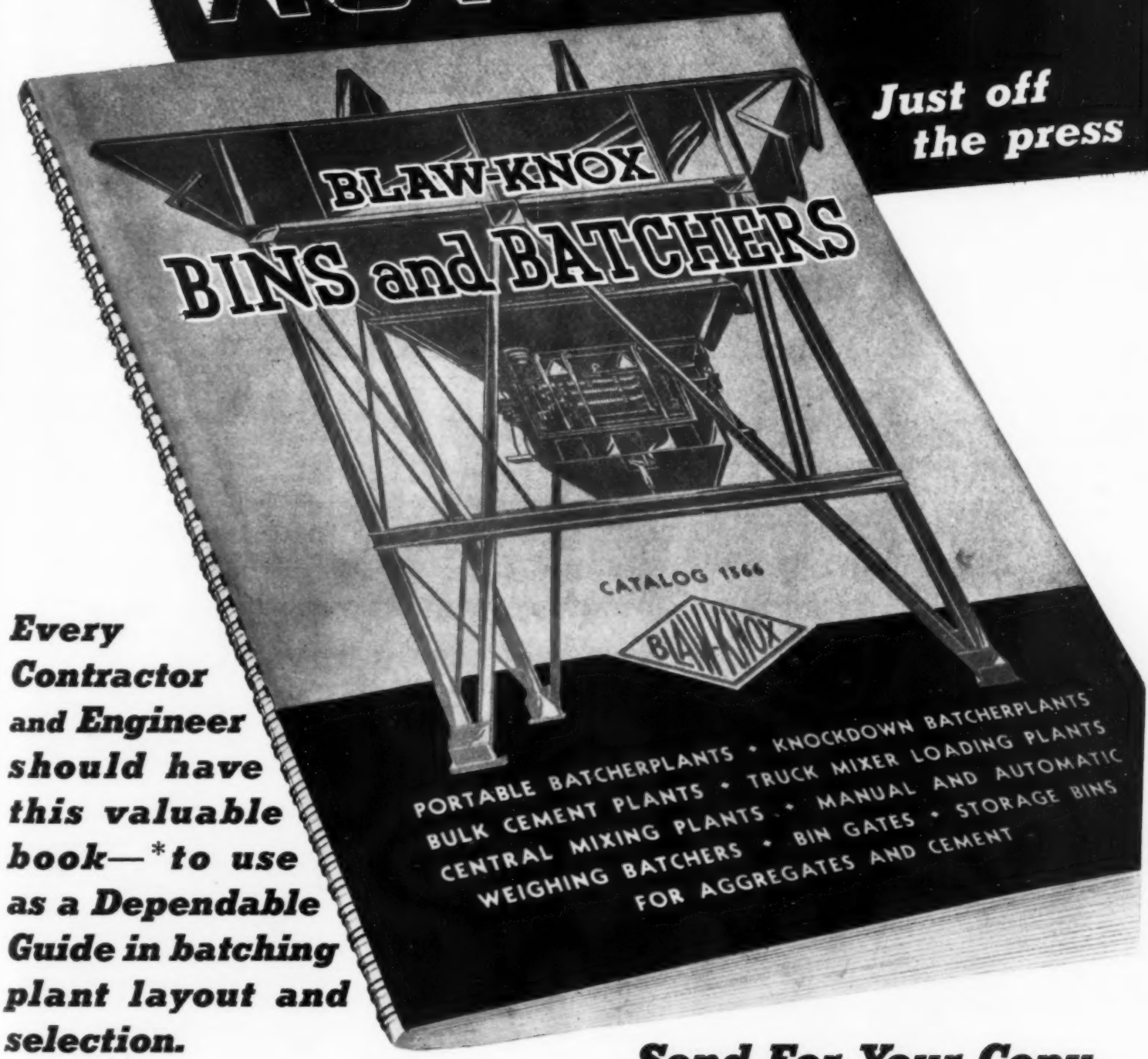
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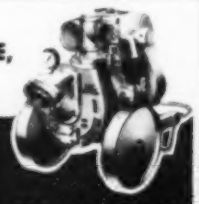
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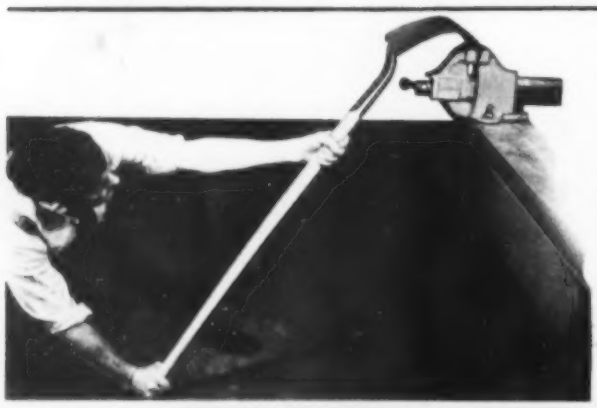
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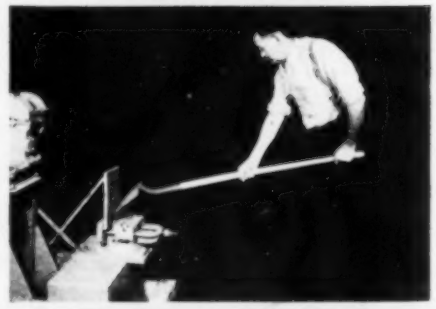

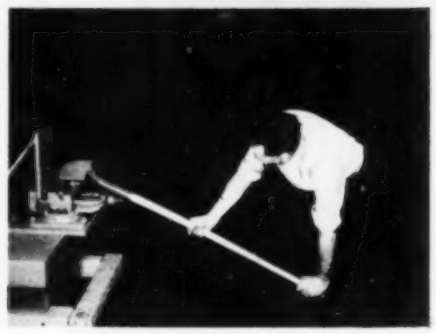

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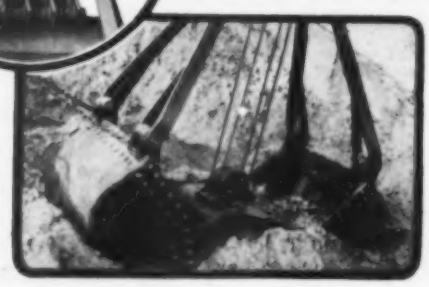

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